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assembly & fastener ENGINEERING

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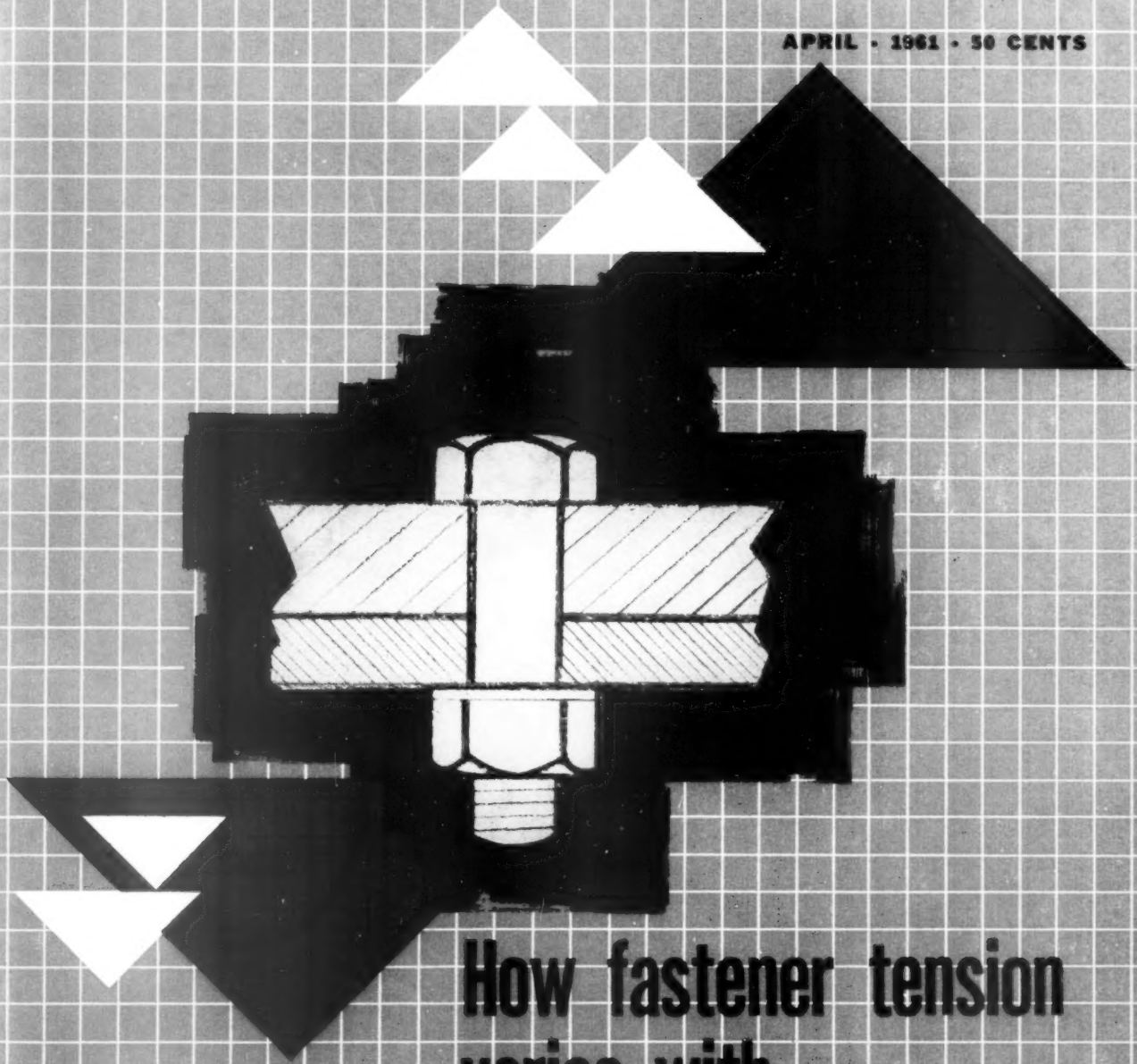

How fastener tension varies with external joint loads

Also in this Issue: ASSEMBLING AIRBORNE COMPUTER CIRCUITRY BOARDS • HIGH-SPEED TRANSISTOR WELDING

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ENLARGED VIEW

PHEOLL P

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New, compact 44-station automatic transfer machine brings the benefits of automation within reach of most manufacturers.

It's about half the size of other top-quality transfer machines, far less expensive, too. What's more, it dovetails neatly into the trend to smaller and smaller products and assemblies by providing more stations per foot.

It's a machine that could be ideal for you if you make any product that involves several station-to-station operations.

WHAT IS A TRANSFER MACHINE?

It's automation's basic building block. It moves pieces-in-production from one tool or worker to another, stops the piece long enough so it can be bent, drilled, tapped, heated, measured, molded, riveted, coated, assembled, packaged, etc.

Sylvania makes several models of these basic machines. And if you do not have facilities, we can recommend reliable and experienced manufacturers of the necessary tools, jigs, etc., which you'll need in your automation program.

HOW TO AUTOMATE

That's a tough one. It varies almost with each manufacturing operation. Sylvania will provide free consultation to help with your particular problem but, in any event, there's one basic rule for almost every situation: *You must start with the best transfer machines if you're going to realize the full benefits of automation.*

Naturally, you pay more for the best. But a good transfer machine can last for 30 years or more. What's more, by changing tools and jigs, it can be adapted to almost any conceivable production operation. You can even change products without changing transfer machines.

WHERE TO BUY

Naturally, we're a bit biased, but we believe Sylvania transfer machines are the best on the market.

We've been building them for our own use for over 20 years, because we have never been able to buy one that met our accuracy standards for the manufacture of lamps, tubes, fine electronics equipment.

We make two general types—Rotary indexing chassis and Conveyor indexing chassis. Both have many exclusive features which contribute to their outstanding performance. And we also make 5 models of precision indexing transmissions of superior quality.

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Please send me free brochure of:

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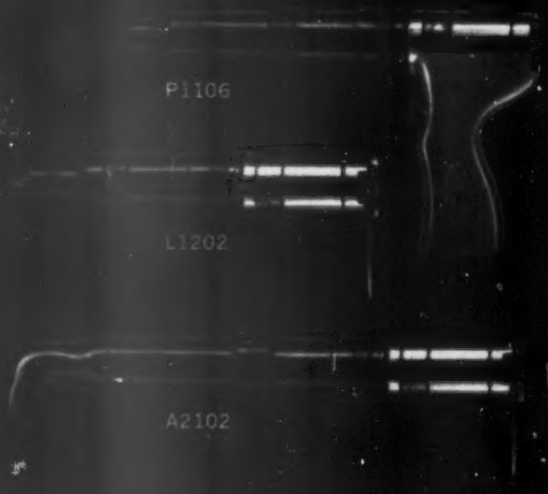

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assembly & fastener ENGINEERING

BETTER DESIGN AND ENGINEERING FOR ASSEMBLY

Volume 4, Number 4 April, 1961

FEATURES

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BPA

COMING NEXT MONTH

- Automatic Assembly of Relays
- How Fastener Tension Varies—Part 2
- How to Design for Brazing
- Barbed Latch Solves Missile Problem
- Choosing Super-Alloy Spring Material

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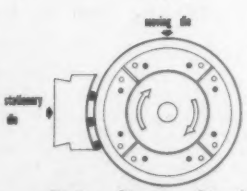

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Letters to the Editor

Selection of Adhesives

It will be appreciated if you will send me a copy of "Selection and Use of Adhesives" which was published in your August and September 1960 issues.

D. H. Stone, Engineer
Product Design Support
Temco Electronics Div.
Temco Electronics & Missiles Co.
Dallas, Texas

• Reprints of this article are available upon letterhead request.

Lubrication and Bolt Torque

Please send me a copy of "How Lubrication Affects Torque-Tension Relationships" which appeared in your September 1960 issue.

Charles H. Sperry
Metallurgical Consultant
Engineering Materials Research
International Harvester Company
Hinsdale, Illinois

• Reprints of this article are now available upon letterhead request.

Friction & Bolt Tension

Please send two reprints of Harry Gerstung's excellent article on "Friction as a Factor in Bolt Tension, Galling and Seizing" which appeared in your January and February issues.

This article presents information which parallels some of our present testing. Congratulations to the author.

E. B. Palmer
Senior Design Engineer
Convair Division
General Dynamics Corp.
Fort Worth, Texas

• Just as reprints of your article in September on "lubrication and torque" are now available, we expect to have reprints of Mr. Gerstung's article available in the near future.

Micro-Joining

In your January issue was an article on "Soldering and Welding of Miniature Products." Would you please supply us with the address of the Cavitron Corporation, or advise Cavitron of our interest so they may contact us.

Fred E. Dole, Director
Research & Development
Ace Electronics Associates
Somerville, Massachusetts

Please send us additional information on the Cavitron welder-solderer.

George S. Gati
Development Engineer
General Electric Company
Syracuse, New York

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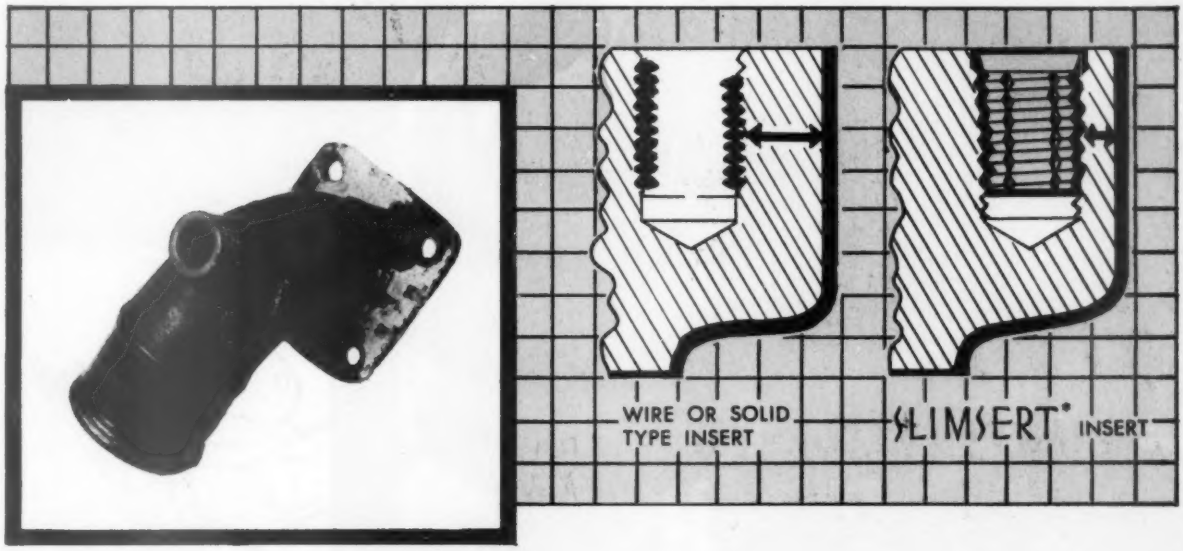

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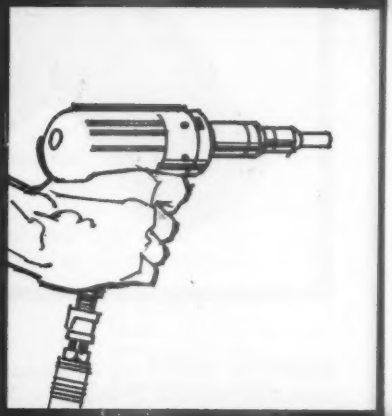

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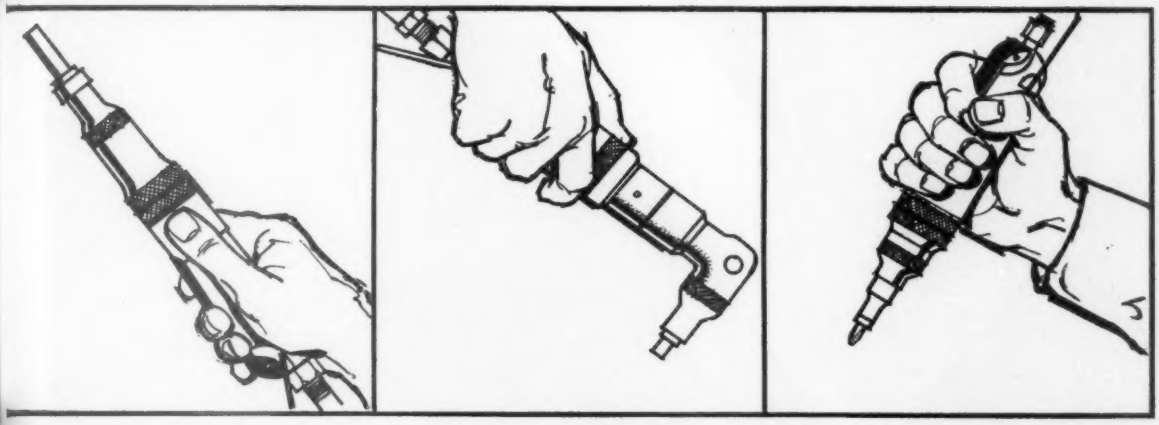

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APRIL, 1961, VOL. 4, NO. 4

NEW AVENUES TO LOWER ASSEMBLY COSTS

During the late '40's and early '50's, our new straight-line assembly plants were the envy of the industrial world. Visitors from overseas would marvel at plants which could assemble several thousand appliances in a single day. And we had many dozens of such "showcases" throughout the country in various industries.

These facilities used the latest mechanical devices to speed production, minimize manual labor, and turn out better products. The trouble, as so well seen with hindsight, is that many of these plants were geared to operate economically only in a seller's market.

Now with the buyer calling the shots, executives are frantically looking for ways to keep their sprawling assembly plants operating in the black. They had become so committed to progressive straight-line assembly that they failed to consider other avenues to efficient low-cost production.

And such avenues are being pioneered every day. They are concerned with hand assembly techniques as well as automatic assembly.

For hand assembly, there are the individual work stations which are virtually complete assembly plants in miniature. For small products you no longer need long lines of workers performing progressive operations. Utilizing audio-visual instruction (see November 1960 cover story), these stations now permit individual workers to completely assemble products the size of portable tv sets and smaller.

For automatic assembly, there are new machines designed to operate economically around the clock, or for only a few hours a day as needed. Some of these machines have built-in inspection devices which automatically reject faulty components or faulty end-products. Such machines could be used most advantageously in the assembly of critical automotive, aircraft and missile components.

These are just a few examples of what is currently available to help American industry reduce its high assembly costs which have contributed to our vulnerability in the world markets, including our own domestic market.

It's time to completely revamp our thinking regarding product assembly. We must be continually alert to new techniques, and adopt those which fill our needs—even if it means obsoleting equipment every year or two.

Matt E. Hensley

Editor

NEW.

clip-on receptacle cuts 1/4 turn fastener installation time by 86%

for **LION** 1/4 *turn* **FASTENERS**

Riveting and welding are eliminated by the new, time-saving clip-on receptacle that just slips over a hole in your door frame and locks itself in place.

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Operation is fast—1/4 turn to lock, 1/4 turn to unlock.

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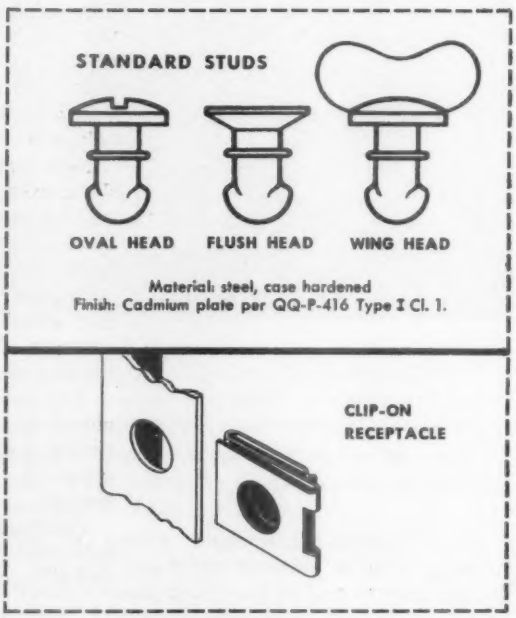

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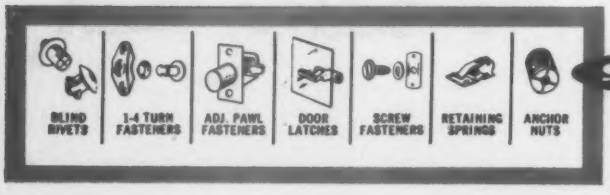
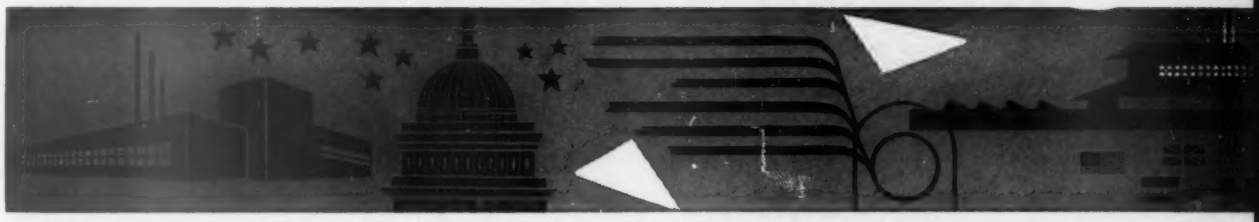


SOUTHCO FASTENERS
LION

The State of Business



PLANT MODERNIZATION A "MUST" FOR ECONOMIC GROWTH

Modernization of plant facilities, replacement of productive equipment and capacity to produce are getting top priority and attention in Washington. The president showed a commendable awareness of three major problems which must be attacked if our country is to remain strong: economic growth, plant modernization, and price stability.

Before a packed house, he expressed thoughts every business held dear, and which every businessman had been trumpeting for years. "Capacity operation is the key. No matter what other arguments or stimulants are used, the incentives for investing new capital to expand manufacturing plants and equipment are weak as long as manufacturers are operating at less than 80% of capacity. From 1950 to 1958 we put only one sixth of our total output into capital formation, while Japan, Germany, Italy, the Netherlands, Canada, and Sweden were all investing one fifth or more of their total output in capital goods. So it is not surprising that each of these and other nations over the past several years has surpassed us in average annual rate of economic growth."

In speaking of plant modernization the president said, "New plant investment not only means expansion of capacity; it means modernization as well. Gleaming new factories and headlines about automation have diverted our attention from an aging industrial plant. Obsolescence is slowing down our growth, handicapping our productivity, and worsening our competitive position abroad."

> **"I shall propose to the Congress a new tax incentive for business to expand their normal investment in plant and equipment."***
>
> **President John F. Kennedy**

U.S. IS "FALLING BEHIND"

"Nothing can reverse our balance-of-payments deficit if American machinery and equipment cannot produce the newest products of the highest quality in the most efficient manner. The available evidence on the age of our industrial plant is unofficial and fragmentary; but the trend is unmistakable—we are falling behind.

"The average age of equipment in American factories today is about nine years. In a dynamic economy, that average should be falling, as new equipment is put into place. Instead, the available evidence suggests that it has been slowly rising. Private surveys of machine tools used by manufacturers of general industrial equipment found less than half of these tools over ten years old in 1949, but two thirds over that age in 1958. Nineteen per cent of our machine tools were found to be over twenty years old.

"Meanwhile, other countries have been lowering the average age of their fixed capital. The German example is the most spectacular: their proportion of capital equipment and plant under five years of age grew from one sixth of the total in 1948 to two fifths in 1957.

"All of these facts point in one direction: We must start now to provide additional stimulus to the modernization of America's industrial plant. Within the next few weeks, I shall propose to the Congress a new tax incentive for businesses to expand their normal investments in plant and equipment."

STABILITY VS. INFLATION

The president realizes that the government is almost without "direct and enforceable powers over the central problem." He continued, "A free government in a free society has only a limited influence over prices and wages freely set and bargained for by free individuals and enterprises. And this is as it should be if we are to remain free.

"Nevertheless, the public interest in major wage and price determination is substantial. Ways must be found to bring that public interest

continued

*President John F. Kennedy's address to the luncheon meeting of the National Industrial Conference Board, Washington, D.C., February 13, 1961.

This Formula Will Lower Your Assembly Costs!

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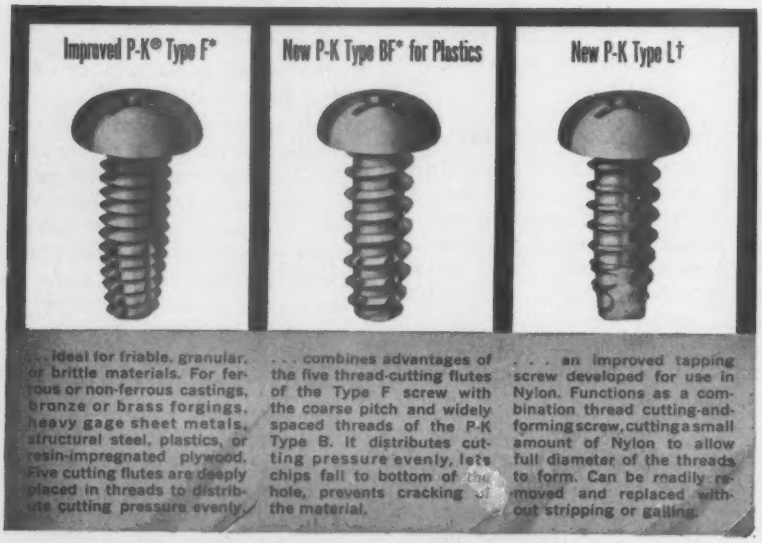
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New P-K Type BF* for Plastics
New P-K Type L†
. . . ideal for friable, granular, or brittle materials. For ferrous or non-ferrous castings, bronze or brass forgings, heavy gage sheet metals, structural steel, plastics, or resin-impregnated plywood. Five cutting flutes are deeply placed in threads to distribute cutting pressure evenly.
. . . combines advantages of the five thread-cutting flutes of the Type F screw with the coarse pitch and widely spaced threads of the P-K Type B. It distributes cutting pressure evenly, lets chips fall to bottom of the hole, prevents cracking of the material.
. . . an improved tapping screw developed for use in Nylon. Functions as a combination thread cutting-and-forming screw, cutting a small amount of Nylon to allow full diameter of the threads to form. Can be readily removed and replaced without stripping or galling.

PARKER-KALON®

THREAD-CUTTING SCREWS AND SEMS

PARKER-KALON a division of General American Transportation Corporation, Clifton, New Jersey • Offices and Warehouses in Chicago and Los Angeles.

*Patent Pending

†U.S. Patent 2,350,346

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before the parties concerned in a fair and orderly manner. For this reason, I have announced my determination to establish a presidential advisory committee on labor-management policy, with members drawn from labor, management, and the public. I want this committee to play a major role in helping promote sound wage and price policies, productivity increases, and a betterment of America's competitive position in world markets. I will look to this committee to make an important contribution to labor-management relations, and to a wider understanding of their impact on price stability and economic health. And in this undertaking, I ask and urge the constructive cooperation of this organization and its members.

"Economic growth, plant modernization, price stability—these are all intangible and elusive goals. But they are all essential to your success, and to the success of our country. Initiative, innovation, and hard work will be required, on your part and on ours." •

BUSINESS BAROMETER

Steel castings, one of the industry's bellweathers of the economy, should show an increase in production by the third quarter of this year, according to Wilson H. Moriarity, vice president and group executive of Cleveland's National Malleable & Steel Castings Co.

The report, a consensus of an industry-wide survey, was given by Moriarity at the centennial meeting of the Steel Founder's Society in Chicago, last month.

The report also notes that the industry's bookings of steel castings early this year were equal to last year's average, bounding back from a weak fourth quarter in 1960.

The bookings for the second quarter of this year are expected to decline somewhat, before the expected third quarter rise.

Over-all production for the year should average the 1959 and 1960 levels by the end of the year.

U.S. output for 1959 was 1,413,000 tons, and the figure for 1960 is expected to be about 1,400,000 tons. •

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HOLO-KROME REPRESENTATIVES ARE READY TO HELP YOU DESIGN AND MANUFACTURE FOR GREATER PROFIT

To take advantage of the special knowledge that's available to you, call a Holo-Krome representative. He's an expert on top-quality THERMO-FORGED* socket screws and is skilled in all phases of applying them. He'll help you design the best fastener into your product in a way that will keep manufacturing costs at a minimum.

Application assistance, same-day service and cost-reducing quality make Holo-Krome THERMO-FORGED socket screws your best fastener buy. Like full details on how Holo-Krome quality and service can help increase your profit? See your authorized Holo-Krome distributor, or write for more information.

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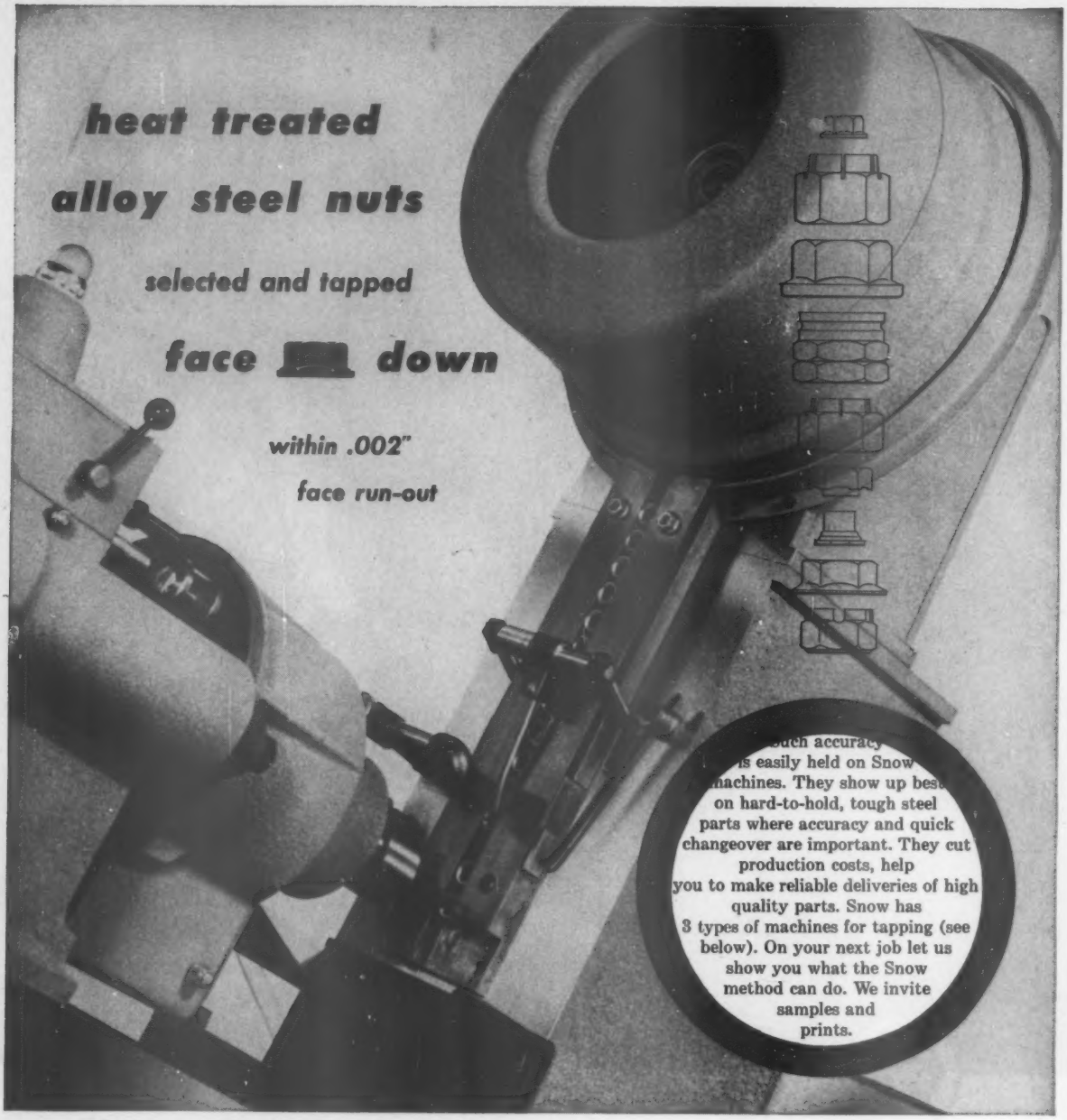

...uch accuracy ...s easily held on Snow ...machines. They show up best on hard-to-hold, tough steel parts where accuracy and quick changeover are important. They cut production costs, help you to make reliable deliveries of high quality parts. Snow has 3 types of machines for tapping (see below). On your next job let us show you what the Snow method can do. We invite samples and prints.

SNOW NUT TAPPER (like above). Hopper can select flanged nuts FACE DOWN.

SNOW HORIZONTAL MACHINE For special parts that need clamping. Hopper or hand feed.

SNOW VERTICAL MACHINE For short runs on a quickly changed dial index plate.

Snow Manufacturing Co., Dept. C, 435 Eastern Avenue, Bellwood, Illinois. Telephone, Chicago, ESTebrook 8-7142

master ...re... ...ar... ...tooling costs

SNOW

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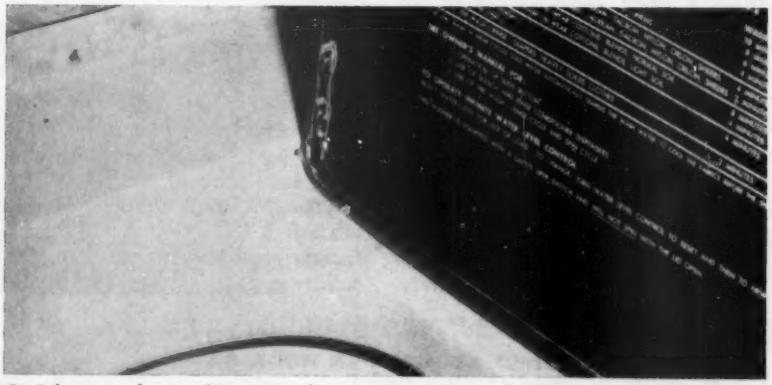
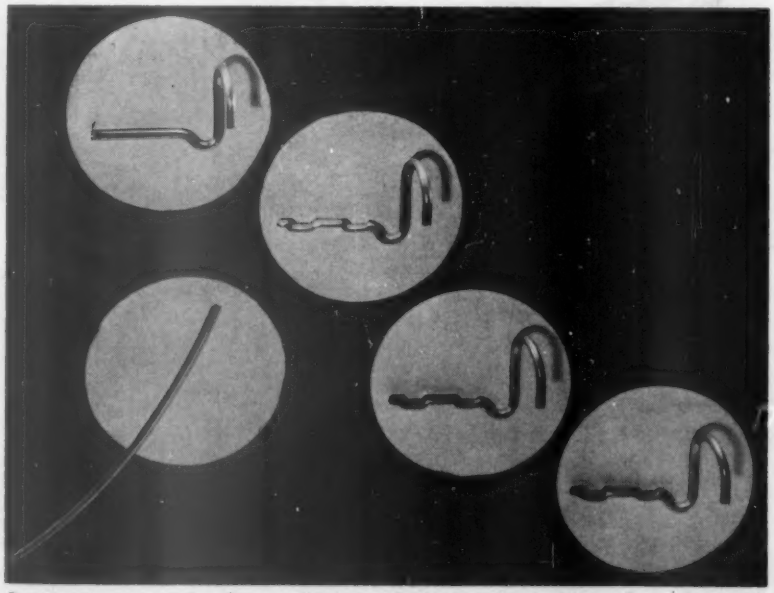
Ideas and Field Reports

SUCCESSIVE LOTS OF CONSISTENT TENSILE STRENGTH WIRE AIDS PRODUCTION



Stainless steel wire hinge used on washer door of 1961 Whirlpool washer.



Progressive steps in the production of the precision hinge from 0.1875" stainless wire (lower left), show the part after automatic four-slide forming (top) punch press flattening, drilling and tapping, passivating and burnishing.

Mass production of wire door hinges, held to extremely close tolerances, was made possible through the use of stainless steel wire made in successive lots with a consistent tensile strength.

Undergoing multiple forming operations, the Dudek & Bock Spring Mfg. Co., Chicago has made over a million parts without a reject.

Five different hinges, produced on separate production runs, are made on automatic four-slide wire forming equipment.

All specified tolerances for the hinges are governed by the diameter and tensile strength of the wire. Limits of plus or minus 0.001" had to be held on the diameter so that other forming tolerances could be met.

The parts are severely formed from 0.1875" type 430 stainless wire. The company is using the wire to mass produce door hinges for home laundry equipment manufactured by the Whirlpool Corporation of St. Joseph, Mich.

Design considerations of the wire hinge, besides consistent tensile strength, were that of appearance and resistance to the corrosive action of modern laundry detergents. Each hinge had to fit perfectly on the washer or dryer door, and had to withstand years of hard use.

To give the wire a bright finish, as well as proper tensile strength, the Webb Wire Division of Carpenter Steel Co. gave each coil a light pass before it was shipped.

continued

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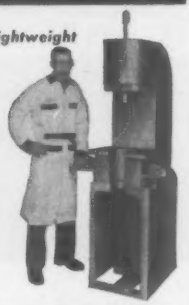
15 TON—AIR HYDRAULIC

• Durable • Lightweight
• Compact



Model C-500. A versatile press with 8¼ inch throat. 6 inch stroke, 2 inch adjustment, equalized pressure full length whether feather-touch or full blow. 100 pound air line gets up to 21 tons delivery. Stand or bench installation. Moving parts protected in handsome housing. Adjustable speeds. Hand, foot or automatic controls. Simple, tireless and safe operation. Women like it. Long, trouble-free service. Easy to maintain and repair. For all kinds of materials. Thickness no problem. Rivets, flanges, broaches, stakes, crimps. Many other uses.

WRITE TODAY FOR INFORMATION REGARDING APPLICATION TO YOUR JOB . . . AND HOW LITTLE IT WILL COST YOU.

AIR-HYDRAULICS INCORPORATED

CUSHIONED STOP . . .
FOR ACCURATE INDEX

HERE'S YOUR ANSWER, if accuracy and dependability are important to you. Cushioned stop eases work to position. Locking cylinder stops the table "on the money" and holds it until released by locking dog. Changes in loads, diameters or speeds are no problem either, since both speed and cushion are adjustable. Top plate is 15" in diameter but the rugged mechanism will handle much larger work loads. Table will make up to 100 indexes per minute with a 22" diameter, 200 lb. load.

OPERATES on 60-175 lbs. pressure when equipped for air but table is available for either air or hydraulic operation. 4, 6, 8, or 12 stations are standard but others, up to 30, are made to order.

REPRESENTATIVES:
SOME TERRITORIES STILL OPEN.
WRITE FOR INFORMATION.

AIR-HYDRAULICS INCORPORATED

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JACKSON, MICHIGAN
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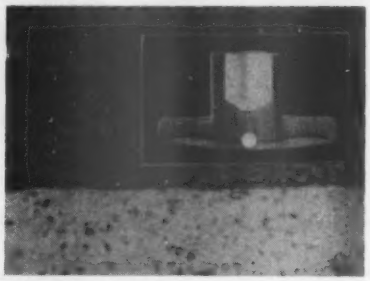
Inconsistent tensile properties at one time had created several costly problems. Rejects, because of serious distortion ran from 5% to 7% on large production runs.

The physical properties of the stainless wire have been so consistent that Dudek & Bock have been able to virtually eliminate rejects, increase production, and vastly reduce the amount of time required to check the material through both production and final inspection.

RIVETS ATOMICALLY BONDED TO PRECIOUS METALS

A process for the manufacture of electrical contact rivets atomically bonds an electrical contact facing of precious or semi-precious metal to a base metal rivet body. Substantial cost reduction is effected by the process, as well as limiting the area and thickness of the precious metal to requirements of the application. The area may extend from a small centered ellipse to complete envelopment of the rivet head. Thickness can be controlled from .005" to 85% of the total head thickness.



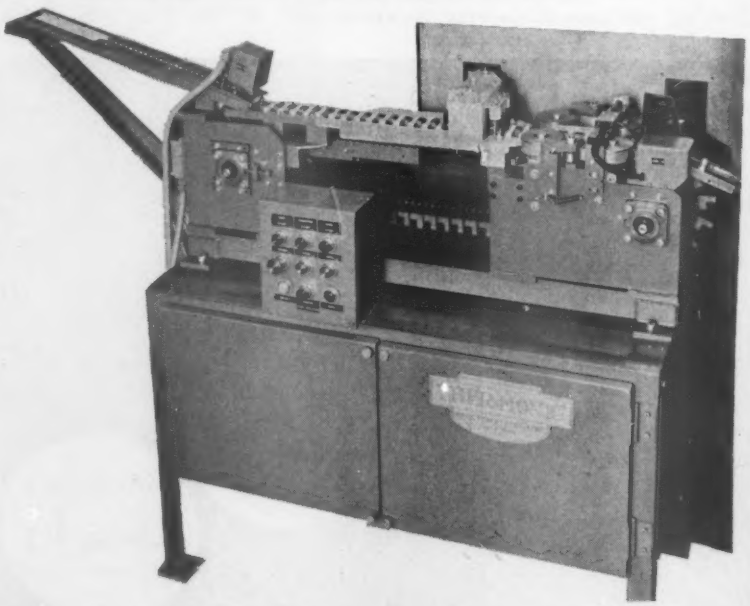
Photomicrograph (1100X) showing dispersion of silver and copper grains forming Atomiclad bond.

By not requiring brazing materials, fluxes or annealing temperatures, contacts with 100% usable facings in a desirable work-hardened state are produced.

Designed by Gibson Electric Co., presently supplied facing materials include fine silver plus most of the widely used silver alloys, palladium, gold, and platinum.

Presently available rivet types include flat, full crowned and conical facings with base metal shanks in solid, indented or tubular forms.

FUSE ENDS SOLDERED AT 3000 PER HOUR RATE



A machine designed and built by Induction Heating Corp., soft-solders the ends of caps to fuse links at the rate of 3000 fuses per hour.

The fuse casing is manually pre-

continued

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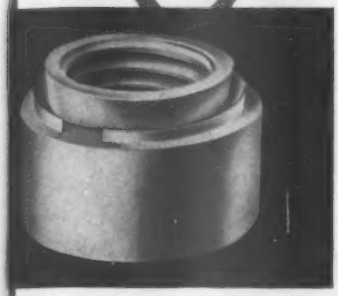
PEM CAPTIVE THREADS for Production Fastening . . .

THE ORIGINAL SELF-CLINCHING FASTENER



Made in steel, stainless steel, aluminum and Monel. Positively locked into prepared holes by any standard squeezing tool. For metal thicknesses down to .032". Sizes from No. 0 to ¾". Bulletin CL.

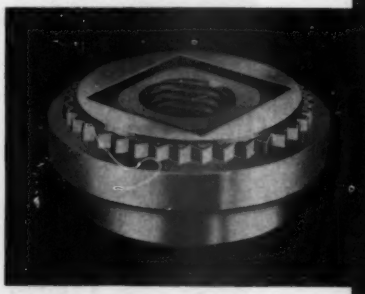
SELF-LOCATING WELD FASTENER

Steel and non-magnetic stainless steel. Nut is projection welded to part with extended shank protecting threads from weld splatter and serving as pilot in assembly. No. 2 to ¼". Bulletin WN.

SELF-CLINCHING, SELF-LOCKING NUT

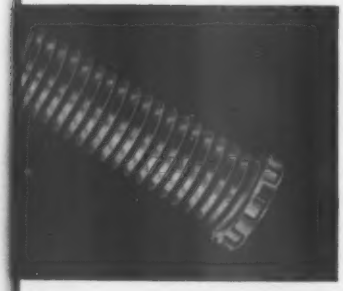
All metal (steel, stainless steel or aluminum) combines 2 functions in single light-weight, low-cost unit for sheet metal fastening. Suitable for installation in sheet thicknesses from .040" and up. Sizes from No. 2 to 10. Bulletin SL.

SELF-CLINCHING FLOATING NUT



Carbon steel and stainless steel. Provides rapidly assembled nut anchor in sheet metal and compensates for slight errors (up to ½") in alignment of mating holes. Sizes No. 2 to ¼". Suitable for sheet thicknesses from .040" up. Types AS and AC.

SELF-CLINCHING CAPTIVE STUD



Steel and stainless steel, designed for quick, easy flush-head installation in panels of cold-rolled steel, brass, copper, aluminum alloys and similar materials. Sizes No. 4 to 5/16". Lengths from ¼" to 1½". Bulletin FH.

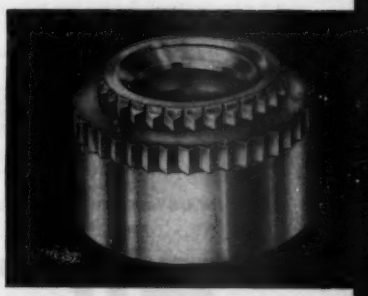
SELF-CLINCHING STAND-OFFS

Made in both blind and threaded-through types in steel, aluminum and stainless steel. Sizes No. 4 and No. 6. Overall lengths from ⅛" to 1 1/16". Suitable for use in sheet thicknesses from .040" and up. Bulletin SO.

SELF-CLINCHING FLUSH FASTENER

One-piece, stainless steel threaded insert installs in sheet thicknesses from .061" and up with flush mounting area on both sides of sheet. Suitable for materials with Rockwell Hardness of B-70 and less. Sizes No. 2 to ¼". Bulletin FH.

SELF-CLINCHING SPLINE FASTENER



For hard metals and brittle materials — magnesium, glass laminates, epoxies, etc. Made in steel and stainless steel. Sizes No. 2 to ⅜". Type KF.

PENN ENGINEERING & MANUFACTURING CORP.

DOYLESTOWN • PENNSYLVANIA

NEW YORK (BELLE HARBOR, L.I.)—NEPTUNE 4-7103 INDIANAPOLIS—CLIFFORD 1-4020 MILWAUKEE—BLUEMOUND 8-6128
CINCINNATI—GRANDVIEW 1-9011 DETROIT—UNIVERSITY 3-5189 MINNEAPOLIS—GREENWOOD 4-6203
CHICAGO (FOREST PARK, ILL.)—FOREST 6-4971 TOLEDO—GREENWOOD 4-9563 DALLAS—FLEETWOOD 7-5713
MIAMI—TUXEDO 5-3147 LOS ANGELES—BRADSHAW 2-8087

assembled with the link, a 50/50 sandwich type soft solder washer, and cap. The assembled parts are then placed on an inclined plane magazine. An escapement feeds the parts onto a straight-line moving conveyor, and the soft-soldering process begins.

The machine performs two other necessary functions besides the soldering job. After the fuses pass through a low-voltage conveyor type work-coil, the completed parts pass through a sizing device. The sizing insures that the cap is pushed snugly up to the link, displacing the molded solder and making a 100% contact with the cap. A secondary benefit is that all fuses are manufactured in the same uniform length.

The fuses are checked automatically for continuity before they leave the conveyor and the rejected fuses are shunted into a tote box.

SWITCH IN COMPONENT PART SAVES $7000 YEARLY

The simple switch from a solid tapered pin to a tubular spring pin saved Friden, Inc. of San Leandro, California more than $7000 a year.

The prime purpose of the change, and the principal source of cost saving, was the elimination of the taper ream operation formerly required by the solid pin.

The pin is used in the assembly of its counter dial shafts. As many as eleven pins are used in a single calculator.

When solid tapered pins were used, the hole was drilled and taper

continued

Locating fixture enables operator by single stroke of arbor press lever to drive spring pin home into previously drilled hole in counter dial hub and shaft.

FASTENER ABILITY AT YOUR SERVICE!

Start with "Fastener Engineering Know-How" . . . Metallurgical Laboratory . . . and the most modern Heading, Grinding, Threading, Heat Treating manufacturing facilities . . . and you have quality fasteners.

They're at your service . . . at AIC. Complete inventories on Torq-Set®, Phillips, External and Internal Hex and 12 point External Wrenching Bolts . . . and all types of fasteners are maintained at AIC.

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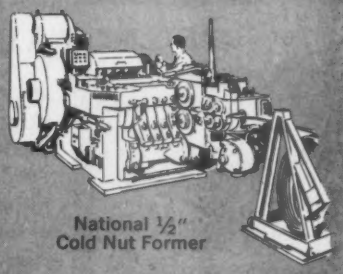
These unusual nut blanks are formed *automatically* — on compact, efficient National Cold Nut Formers.

Quality is excellent, scrap is low and remarkable savings are realized over other methods.

Send us your "Tough Nut Projects." Better yet, come to Tiffin where we can concentrate on *your* nut production. No obligation.



National ½" Cold Nut Former

(Available in sizes ¼" through 1")

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U.S.A.

HARTFORD DETROIT CHICAGO

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HOW KEYSTONE WIRE *adds Sales Appeal* to bobby pins...

To manufacture millions of identical bobby pins, Sta-Rite Ginnie Lou, Inc., Shelbyville, Illinois, needed a high quality spring wire that would perform consistently with long runs in their high-speed automatic wire forming machines.

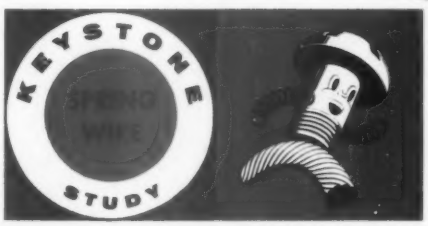
For extra "sales appeal", Sta-Rite Ginnie Lou specified a wire with superior surface that would take an attractive finish to please discriminating women. It had to have high test flex and maximum spring back qualities. This called for uniform temper and close diameter tolerance throughout the coil.

Keystone Metallurgists, in close cooperation with Sta-Rite Ginnie Lou, developed a white liquor finish, high carbon *completely clean* spring wire with all these qualities. The large coils are specially packed with rust preventive in payoff packs for long trouble-free runs.

Says Vaughn C. Wallace, Vice President in charge of manufacturing, "Keystone Wire, with its superior finish, produces a bobby pin which meets our high standards of quality and ready acceptance in thousands of outlets across the nation." Keystone's excellent wire forming features are the result of accurately controlled thermal treatment and correct chemical analysis to provide the right structure for this difficult cold rolling and forming operation.

Keystone Wire Specialists can produce a wire for your most exacting specifications. Contact your nearest Keystone Wire Representative soon. Or write us concerning your wire problems.

Keystone Steel & Wire Company, Peoria, Illinois



KEYSTONE

WIRE FOR INDUSTRY

MANUFACTURED AT PEORIA, ILLINOIS, U. S. A.

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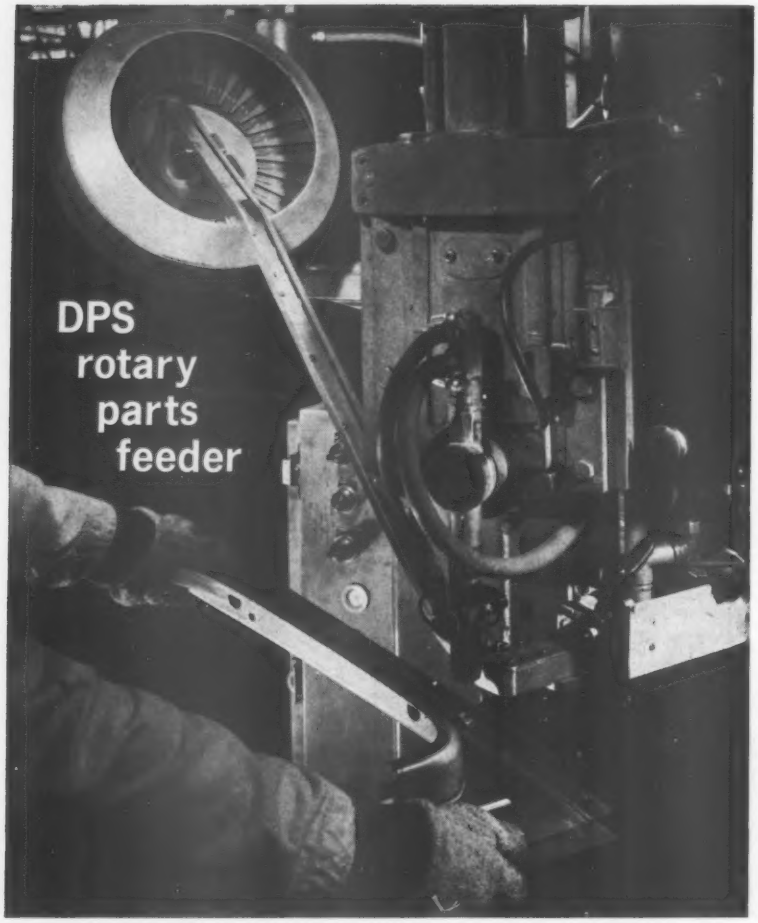

doubles nut welding output in sub-assembly production line

In this sub-assembly operation, production of the welding equipment was limited because the weld nuts had to be hand positioned. When the DPS rotary parts feeder took over the feeding operation, nut welder output was doubled.

Savings and efficiencies such as this are being effected in assembly operations throughout industry. Parts of a variety of sizes, shapes and materials are successfully being handled in DPS rotary, vibratory and elevating type parts feeders . . . industry's most complete line. Parts ranging from common bolts, nuts and screws to the many more unusual pieces that are used in the complex machinery of today.

DPS engineers welcome the opportunity to work with your engineers in analyzing assembly problems and production line procedures. They will recommend the one best feeder to effect lower manufacturing costs and improved product quality. Write or call today. Ask for free catalog.

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A Subsidiary of Link-Belt Company

Selective Parts Feeders; Screw, Nut and Stud Driving Machines; Special Purpose Assembly Machines

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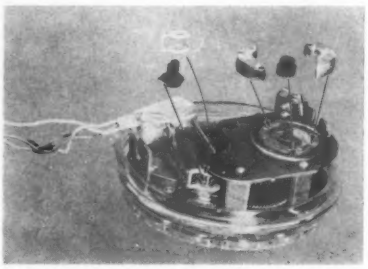
Counter dial shaft assembly on which company has saved over $7000 yearly.

reamed in a two-spindle drill press. Care had to be exercised to hold depth of the taper, in order to control depth of tapered pin insertion.

Spring-pin assembly of the counter dial to the shaft consists of a simple two-step, two operator operation, which resulted in over a 50% savings in assembly time.

Use of the spring pins, made by Standard Pressed Steel, also effected a savings of 60% over the solid taper pins previously used.

TELEPHONE DESIGN AIDED BY PLASTIC PART MOLDING



Critical parts in the dial mechanism of telephone handset; Cam, pawl, two governor weights and governor pinion. Pinion and pawl are molded of Nylatron. Pawl is molded of Delrin and weights are zinc die castings.

To achieve the combination of compact design and light weight required for the Princess telephone handset, Western Electric of Indianapolis used small plastic moldings and die castings produced by automatic techniques.

Using high-speed, automatic machines which eliminated many secondary operations, Gries Reproducer Corp. turned out a finished zinc alloy die casting and plastic moldings at the rate of several hundred per minute. Conventional casting and molding methods operate at 2 to 15 cycles per minute.

Among the parts that were suited for automatic production technique, after re-designing, were the governor pinion, cam and pawl, and critical dial parts. All of these parts are im-

portant to the proper timing of the dialing mechanism in the telephone.

A major requirement of the parts was their ability to withstand the wear and stress met in more than two million cycles, the standard test simulating actual lifetime use.

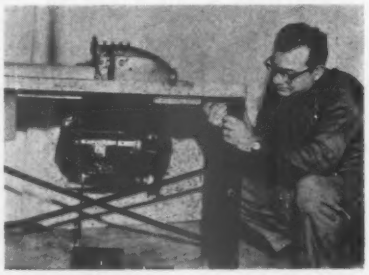
Both the governor pinion and cam are molded of molybdenum disulphide filled nylon, a long wearing material having self-lubrication properties.

The pawl that completes the subassembly is injected molded of a duPont acetal resin, Delrin. Strength in thin sections, good stiffness in flexure, resistance to moisture absorption, high dielectric strength and elastic memory requirements were satisfied with the use of the acetal resin.

A minor, but important part made from molded plastic is the Cycolac stop that is cemented to the plungers which open and close the circuit when the hand set is lifted. Two stops in each set prevent the plunger assembly from falling out when the case is removed.

The bracket for mounting the bell clapper to the base plate, was formerly made of extruded aluminum. Each bracket was sawed to length, embossed, drilled and riveted to the clapper. Automatic die casting in zinc now produces this part in one operation, eliminating secondary operations.

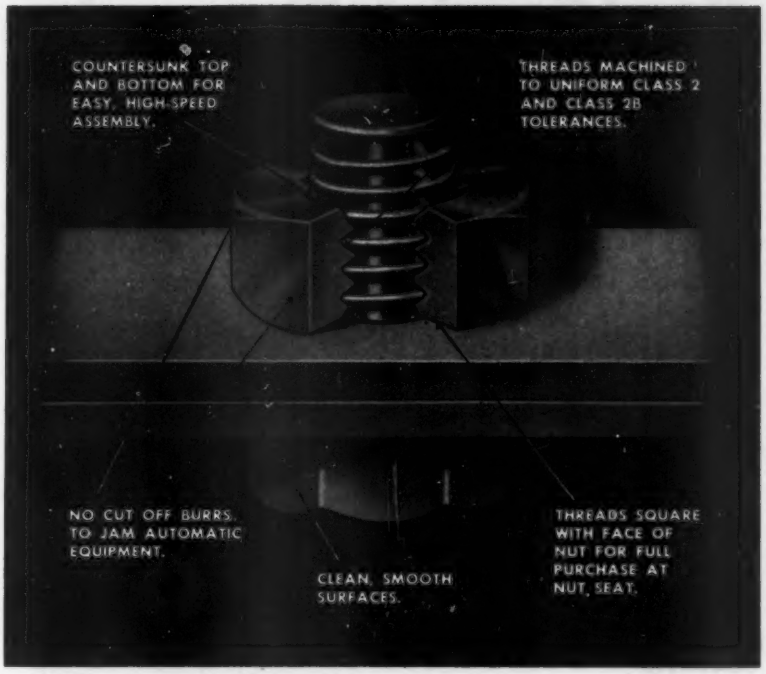
BLIND HOLE INSERTS GIVE SEWING TABLE SMOOTH TOP



Industrial sewing machine table uses locking inserts for fastening the legs and attaching the motor mounting board to the table.

When Union Special Machine Co., Chicago, decided to switch to Micarta finish for sewing machine table tops, investigation was also made to provide a means for fastening the tops to the legs or bases without marring the smooth top surfaces.

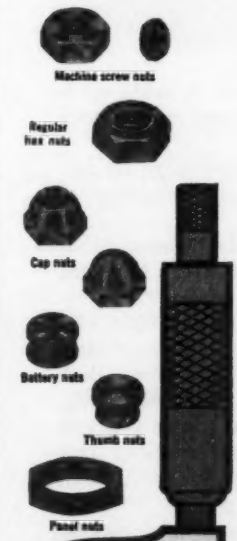
continued


COUNTERSUNK TOP AND BOTTOM FOR EASY, HIGH-SPEED ASSEMBLY.
THREADS MACHINED TO UNIFORM CLASS 2 AND CLASS 2B TOLERANCES.
NO CUT OFF BURRS, TO JAM AUTOMATIC EQUIPMENT.
CLEAN, SMOOTH SURFACES.
THREADS SQUARE WITH FACE OF NUT FOR FULL PURCHASE AT NUT SEAT.

CORNELL

***"Machined from the Bar"* BRASS NUTS**

REDUCE ASSEMBLY COSTS



"Machined from the Bar" brass nuts can save you countless production dollars yearly by speeding your assembly operations and reducing downtime and rejects to a minimum. These precision nuts handle easily, spin on smoothly, tighten securely and, once in place, *stay in place.*

We are specialists in *"Machined from the Bar"* brass nuts. *This is our only product.* Our method of manufacture assures that every nut is a precision product held to close tolerances and checked with go and no-go gauges. This uniformity speeds hand operations and permits trouble-free performance of portable and hopper-fed, high-speed nut setters.

Remember, *"Machined from the Bar"* brass nuts are available *at no extra cost.* Standards are available "off the shelf", shipped the same day the order is received.

Call, wire or write today: Gene Carroll, Yonkers 8-9400. Teletype, Yonkers 4356.

Remember . . ."Machined from the Bar" at no extra cost!

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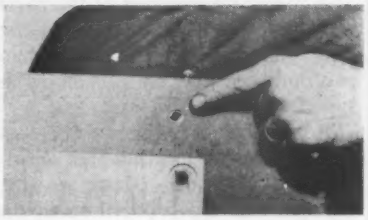

Locking inserts used on under side of industrial sewing machine table.

In the past, Union Special used ordinary bolts, sometimes countersinking them. The table top in this type of installation did not always give a smooth, unbroken surface. Also special care was required in drilling and assembling the top to prevent sharp edges.

To provide a smooth unbroken surface, the company used Tap-Lok inserts made by Groov-Pin Corp. The inserts, with mating bolts are used for attaching the motor to the underside of the table top, as well as for attaching the legs.

BI-METAL COMPOSITE MAKES HIGH PRESSURE STATIC SEAL

A new material for use in high temperature, high pressure static seals, developed by Armour Research Foundation, uses a composite of two metals whose combined properties meet the requirements for seal applications in temperatures up to 1200° F and pressures of 5000 psi.

Developed for the Wright Air Development Division of the U.S. Air Force, the composites are made by impregnating a porous body of fiber metal (or skeleton) with a soft metal.

The fiber metal skeleton combines with the softness and conformability of the impregnant to offer a seal material for most static high temperature-high pressure purposes.

The seals can be made as dense as desired and, therefore, tailored to meet different seal needs.

The fiber metal usually used is molybdenum or stainless steel. The skeletons are made by felting the metal fibers, compressing them and then sintering to form a bond between the fibers at each point of contact.

In one experiment, a composite made of a molybdenum fiber skeleton and impregnated with silver

retained hot air pulsating pressures from zero to 5000 psi at 1200° F. In another experiment, similar pressure extremes and temperature variations were tried. After three temperature cycles, no trace of leakage and no loss of bolt torque was detected.

ADHESIVE CUTS MANIFOLD ASSEMBLY COST 50%

Using an adhesive bonding material to fasten two mating manifold sections has reduced production costs per manifold 50% for the Taylor Instrument Co., of Rochester.

The adhesive assembly techniques also solved other difficult manufacturing problems. It permitted use of lower cost materials, eliminated field failures and rework of rejected assemblies due to leaking.

Assembling sections of manifold after film adhesive has been positioned in place.

The two manifold sections are bonded and sealed with die cut structural film adhesive made by Minnesota Mining and Manufacturing Co. The film provides a uniform thickness throughout the joint and continuous contact between the mating surfaces, giving a seal and bond in a single operation.

With the previous assembly technique, each individual manifold section had to be masked, painted and baked before the assembly operation because the sealer used could not withstand the high baking temperatures of the enamel.

Present techniques permit complete assembly of the manifold, before paint spraying. Both the paint and adhesive are cured in a single oven operation.

The high strength bonded assembly (over 3000 psi) is a pneumatically controlled manifold used in a controller to control a wide range of process variables such as pressure and liquid level. •

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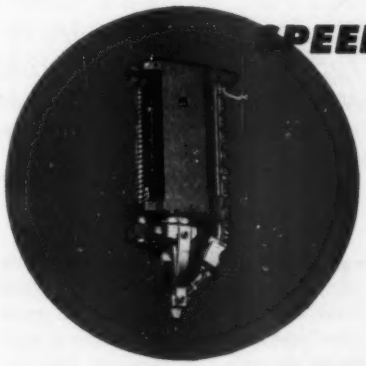

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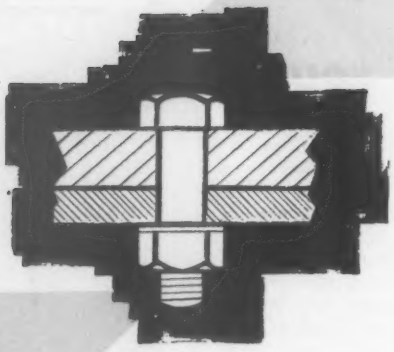


HOW FASTENER

by **W. T. Appleberry**
Design Engineer
Douglas Aircraft Company
Venice, California

PART 1

First of three articles is concerned with theory and formula derivation which will be further explored in Part 2. Mechanical and electronic measurement of preload will be covered in Part 3.

ABBREVIATIONS

A_b = bolt shank cross sectional area

A_{bc} = corrected bolt shank area

A_j = joint area under compression

A_{jc} = corrected joint area

D_{bf} = diameter of bolt face or nut face

D_f = minimum dimension at base of tension fitting

D_h = bolt hole diameter

D_{jc} = corrected diameter on which to base A_{jc}

D_t = outside diameter of tubular joint

e = total bolt elongation

E_b = modulus of elasticity for bolt

E_j = modulus of elasticity for joint

L = bolt grip length

P_b = bolt load under service load

P_j = joint load under service load

P_p = preload (caused by tightening nut)

P_s = service (applied) load

ΔP_b = change in bolt load

ΔP_j = change in joint load

δ = unit deformation

The technology of the current era is advancing so rapidly that tests cannot keep pace with new developments. While making a part twice as strong as required may reduce the need for extensive strength tests, twice the weight rarely helps.

Though some structural failures are due to simple static overload, fatigue failure is becoming more and more a prominent design consideration. This type of failure is related to both the amplitude of stress change, and the number of cycles experienced.

Since stress levels in a complicated structure can only be approximated to a degree commensurate with the complexity, factors of safety are required. Other things such as thermal stresses and the magnitude and frequency of gust loads serve only to increase the error and the need for a larger safety factor. The general solution is to reduce the stress level by increasing the size and, unfortunately, the weight of the part.

However, in a few limited instances, the stress level can be favorably altered without a weight penalty. This is done by pre-stressing the part at initial assembly. Though it results in a higher static stress, it decreases the amplitude of the stress cycle and thus prolongs the fatigue life of the part.

Pre-stressing is usually unfeasible, but in the case of fasteners it is just about unavoidable. Although the following subject matter deals with fasteners, the equations may be adapted to any pre-stressed assembly.

FATIGUE LIFE FACTORS

1. Fastener configuration. (a) Generous head to shank fillet radii reduce stress concentration; (b) Reduced shank diameter relative to thread diameter increases energy absorption capacity of bolt shank, which lowers impact stresses closer to static stress levels; (c) Smooth finishes, etc.

2. Thread and fillet rolling. Threads formerly made by cutting are now produced by reshaping the material. This causes residual compressive stresses which subtract from the induced tensile stresses of preload and applied load. The shank to head fillet is frequently formed by the same method and for the same reason. Rolled threads not withstanding, fatigue failure in

TENSION VARIES WITH EXTERNAL JOINT LOADS

ordinary bolts still occurs generally in the threads.

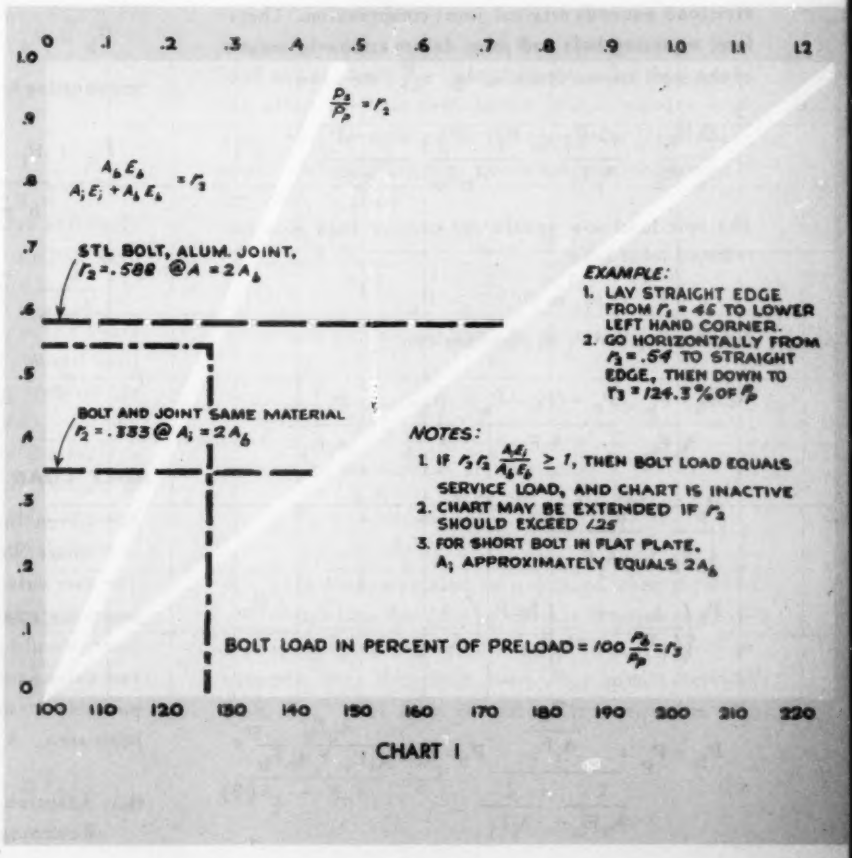
3. Load cycle amplitude between preload and applied load. The two critical factors of amplitude and number of cycles are inversely related, i.e., the lower the amplitude, the more cycles to failure. It therefore becomes desirable to achieve longer fatigue life by reducing the load cycle amplitude, and further, to sustain the maximum service load with a minimum change in the internal bolt load. This is accomplished by inducing a very high preload (about 5 to 20% below the yield point) in the bolt during initial installation. All other quantities being constant, the higher the preload, the less load change is experienced in the bolt when a given load is applied and removed from the joint. The precise reason for this occurrence will be given herein.

While the foregoing may be "old hat" to many engineers, there appears to be widespread misconceptions as to the principles governing the rate at which the tension load in a bolt changes with respect to the application of service tension load. Many have felt that bolt tension does not increase until the service load exceeds the preload. Others believe bolt tension is the sum of preload plus service load. The truth is between these two extremes, i.e., bolt tension under service tension load is always more than preload alone, and is less than the sum of the two.

All materials in nature are elastic to one degree or another. Infinite rigidity is only approached—never reached by even the stiffest substances. It is this fact that is sometimes overlooked in considering bolt load theory. This is to say both the bolt and the joint may very sensibly be thought of as springs, with the bolt (a tension spring) and the joint (a compression spring) exerting force on each other.

Beginning with the assembled joint, the preload is the same in both bolt and joint. Joint thickness has been reduced by the preload as shown in Figure 1. With the slightest application of service load, the bolt begins to extend, permitting the joint to expand closer to its original thickness.

continued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1.0
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0
$\frac{P_2}{P_p} = r_2$
$\frac{A_b E_b}{A_j E_j + A_b E_b} = r_3$
STL BOLT, ALUM. JOINT, $r_2 = .588$ @ $A = 2A_b$
BOLT AND JOINT SAME MATERIAL $r_2 = .333$ @ $A_j = 2A_b$
EXAMPLE:
1. LAY STRAIGHT EDGE FROM $r_1 = .45$ TO LOWER LEFT HAND CORNER.
2. GO HORIZONTALLY FROM $r_3 = .54$ TO STRAIGHT EDGE, THEN DOWN TO $r_3 = 124.3\%$ OF P_p
NOTES:
1. IF $r_3 r_2 \frac{A_j E_j}{A_b E_b} \geq 1$, THEN BOLT LOAD EQUALS SERVICE LOAD, AND CHART IS INACTIVE
2. CHART MAY BE EXTENDED IF r_2 SHOULD EXCEED .125
3. FOR SHORT BOLT IN FLAT PLATE, A_j APPROXIMATELY EQUALS $2A_b$
BOLT LOAD IN PERCENT OF PRELOAD = $100 \frac{P_3}{P_p} = r_3$
100 110 120 130 140 150 160 170 180 190 200 210 220

CHART I

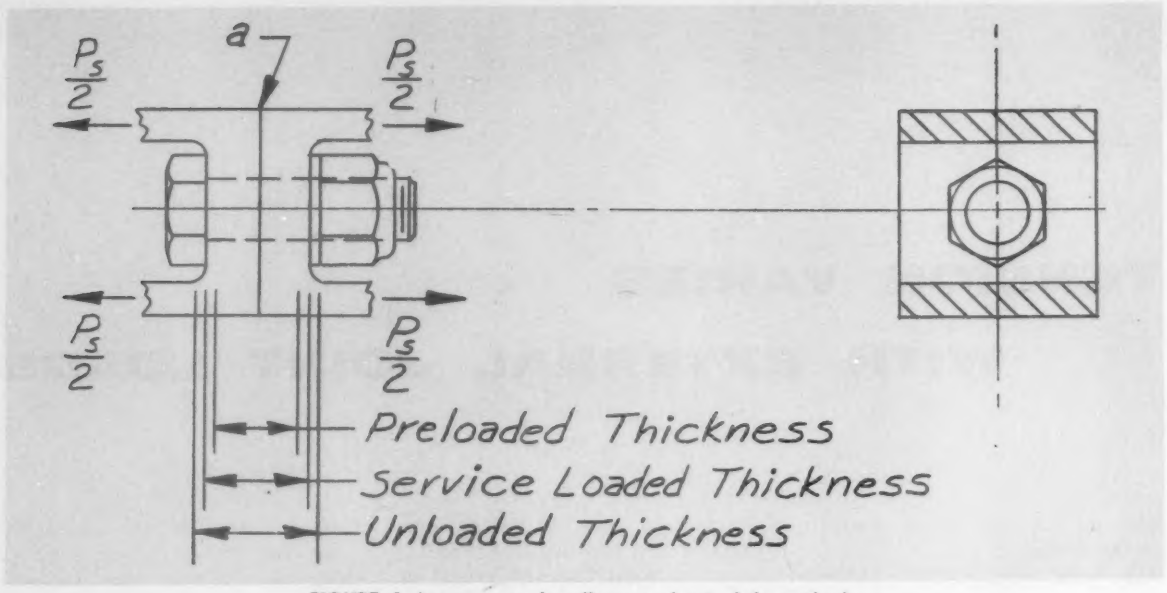

FIGURE 1 (assume no bending or shear deformation)

Thus the bolt load increases from P_p to P_b, or $\Delta P_p = P_b - P_p$, and the joint load decreases from P_p to P_j, or $\Delta P_j = P_p - P_j$. These changes in loads may be expressed as deformations which are equal for bolt and joint until bolt stretch under service load exceeds original joint compression. Therefore, equating bolt and joint deformations by means of the well known formula: $\delta = \frac{P}{AE}$, we have:

$$\frac{\Delta P_b}{A_b E_b} = \frac{\Delta P_j}{A_j E_j}, \text{ or } \frac{P_b - P_p}{A_b E_b} = \frac{P_p - P_j}{A_j E_j} \qquad (1)$$

The bolt load now equals the service load plus the reduced joint load:

$$P_b = P_s + P_j, \text{ or } P_j = P_b - P_s \qquad (2)$$

Substituting for P_j in equation (1):

$$\frac{P_b - P_p}{A_b E_b} = \frac{P_p - (P_b - P_s)}{A_j E_j}, \frac{P_b}{A_b E_b} + \frac{P_b}{A_j E_j} =$$

$$\frac{P_p}{A_b E_b} + \frac{P_p + P_s}{A_j E_j},$$

$$P_b\left(\frac{1}{A_b E_b} + \frac{1}{A_j E_j}\right) = P_p\left(\frac{1}{A_b E_b} + \frac{1}{A_j E_j}\right) + \frac{P_s}{A_j E_j}$$

$$P_b = P_p + \frac{\frac{P_s}{A_j E_j}}{\frac{1}{A_b E_b} + \frac{1}{A_j E_j}} \qquad P_b = P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s \qquad (3)$$

which indicates bolt load equals preload plus only a portion of service load.

JOINT LOAD

P_j may be obtained in the same manner:

$$P_b = P_s + P_j \qquad (2)$$

Substituting for P_p in equation (1):

$$\frac{P_s + P_j - P_p}{A_b E_b} = \frac{P_p - P_j,}{A_j E_j}$$

$$P_j\left(\frac{1}{A_b E_b} + \frac{1}{A_j E_j}\right) = P_p\left(\frac{1}{A_b E_b} + \frac{1}{A_j E_j}\right) - \frac{P_s,}{A_b E_b}$$

$$P_j = P_p - \frac{A_j E_j}{A_j E_j + A_b E_b} P_s \qquad (4)$$

BOLT LOAD CHART

A. Given the preload and expected service load, chart No. 1 gives the increase in bolt tension. The two values for r_2 given, i.e., (1) bolt and joint same material, and (2) steel bolt in an aluminum joint, should prove to be of particular utility. These two values probably cover most applications, except possibly for the noted approximation of the effective joint area, A_{jc}.

B. Adaption of bolt load equation to chart form: Returning to the bolt load equation,

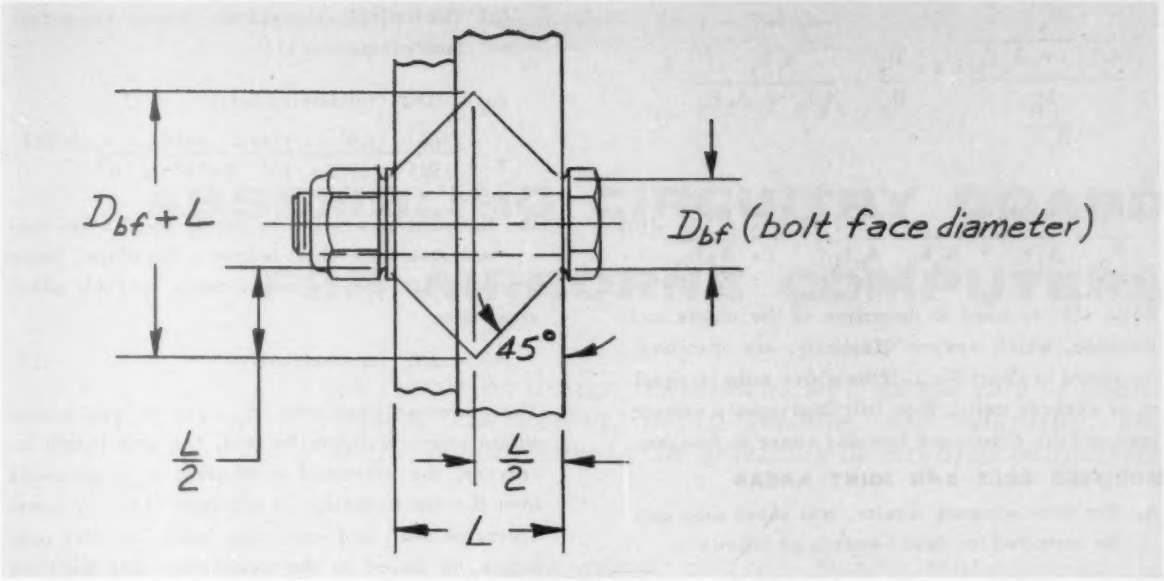

FIGURE 2

$$P_b = P_p + \frac{A_b E_b}{A_j E_j + A_b E_b} P_s, \qquad (3)$$

we may factor P_p as follows:

$$P_b = \left(1 + \frac{\frac{A_b E_b P_s}{P_p}}{A_j E_j + A_b E_b}\right) P_p = \left(1 + \frac{P_s}{P_p} \cdot \frac{A_b E_b}{A_j E_j + A_b E_b}\right) P_p.$$

If we let $P_s/P_p = r_1$, and $A_b E_b / (A_j E_j + A_b E_b) = r_2$, then $P_b = (1 + r_1 r_2) P_p$, (5)

upon which Chart No. 1 is based.

C. Note that if the bolt (and nut) were infinitely rigid, r_2 would equal one, and the bolt load would be the sum of preload plus service load.

D. If the joint were infinitely rigid, r_2 would equal zero, and the bolt load would not change until the preload was exceeded, removing the load on the joint. A gap would appear at "a" (see Fig. 1), and the bolt load is now obviously equal to the service load. Under this condition, the chart ceases to function. It would therefore be desirable to know the service load at which this condition is reached. This is the next item discussed.

POINT AT WHICH JOINT LOAD REACHES ZERO

A. Increase in joint thickness due to removal of joint preload is:

$$\frac{P_p L_j}{A_j E_j} \qquad (6)$$

which equals change in bolt length of $\frac{\Delta P_b L_b}{A_b E_b}$ (6a)

Equation (3) states that the bolt load equals the the preload plus a portion of the service load, which portion is:

$$\frac{A_b E_b}{A_j E_j + A_b E_b} P_s. \qquad (7)$$

Since it is the service load that removes joint preload and restores the joint to its unloaded thickness, the effect on bolt deformation due to service load alone will be equated to the change in joint thickness. Substituting that portion of service load (7) for ΔP_b in (6a):

$$\left(\frac{A_b E_b}{A_j E_j + A_b E_b} P_s\right) \frac{L_b}{A_b E_b} = \frac{P_p L_j}{A_j E_j}$$

Since bolt grip equals joint thickness, $L_b = L_j$, then:

$$\frac{P_s}{A_j E_j + A_b E_b} = \frac{P_p}{A_j E_j} \qquad (8)$$

Solving for the critical service load:

$$P_s = \frac{A_j E_j + A_b E_b}{A_j E_j} P_p \qquad (9)$$

B. This point may also be indicated when the ratio of bolt stretch (due to service load) over maximum joint expansion equals one. When it equals or exceeds one, then bolt load, P_b, equals service load, P_s. This ratio is derived from equation (8):

$$\frac{P_s}{A_j E_j + A_b E_b} = \frac{P_p}{A_j E_j}, \qquad (8)$$

continued

$$\frac{P_s}{\frac{A_j E_j + A_b E_b}{P_p}} = 1 = \frac{P_s}{P_p} \cdot \frac{A_j E_j}{A_j E_j + A_b E_b} =$$

$$\frac{P_s}{P_p} \cdot \frac{A_b E_b}{A_j E_j + A_b E_b} \cdot \frac{A_j E_j}{A_b E_b} = r_1 r_2 \frac{A_j E_j}{A_b E_b} \quad (10)$$

Ratio (10) is used to determine if the charts and formulae, which assume elasticity, are operative. As stated in Chart No. 1, if the above ratio is equal to or exceeds unity, then bolt load equals service load and the charts and formulae cease to function.

MODIFIED BOLT AND JOINT AREAS

A. For more accurate results, bolt shank area may be corrected for thread stretch as follows:

Tests indicate thread stretch for a 1/2" dia. bolt (fine thread) is approximately 37.4% of the unit elongation based on the grip length and using a washer of thickness .064 inch.

(a) Unit elongation = $\delta = \frac{P_b}{A_b E_b}$

(b) Thread stretch = $\frac{P_b}{A_b E_b}$ (.374)

(c) Shank stretch = $\frac{P_b L}{A_b E_b}$

(d) Total elongation is the sum of (b) and (c):

$$e = \frac{P_b}{A_b E_b}(.374) + \frac{P_b L}{A_b E_b} = \frac{P_b}{A_b E_b}(L + .374) \quad (11)$$

Equation (11) may be written

$$e = \frac{P_b L}{A_b \frac{L}{L + .374} E_b} = \frac{P_p L}{A_{bc} E_b} \quad (12)$$

where the corrected bolt shank area is defined as

$$A_{bc} = A_b \frac{L}{L + .374}. \quad (13)$$

Agreement with test results:

(a) A 1/2" dia. bolt of 1-1/2" grip was loaded to 18,679#.

(b) Total elongation was measured at .00616". Theoretical elongation, based on uncorrected formula $PL/A_b E$, equaled .0049339.

(c) Theoretical elongation, using correction factor (equation 11):

A_b = .1925 (undersize bolt),

$$e = \frac{18679\ (1.5 + .374)}{.1925 \times 29.5 \times 10^6} = \frac{35004.4}{5.67875 \times 10^6} = .006164"$$

B. The joint area is approximately equal to the bolt face area for a short bolt in a flat plate. Since the bolt face area is about twice the bolt shank area, then:

$$A_j = 2A_b \text{ (approximately)} \quad (14)$$

The corrected joint area, A_{jc}, can be established within practical limits by test. As grip length increases, the corrected joint area, A_{jc}, increases from the approximation in equation (13). A better approximation, and one that holds for any grip length, is based on the assumption that the compressive stresses in the joint material are dispersed outwardly at an angle of 45° (see Fig. 2).

The average stress, then, would lie along a dispersion line of 22-1/2° originating at the bolt face periphery. So the corrected joint area is based on the average of the bolt face diameter and the diameter generated by the intersection of the 45° dispersion lines:

$$D_{jc} = \frac{D_{bf} + (D_{bf} + L)}{2} = D_{bf} + \frac{L}{2}. \quad (15)$$

D_{jc} is the diameter generated by the intersection of the 22-1/2° dispersion lines. The corrected area, A_{jc}, which of course excludes the bolt hole area, D_h, is:

$$A_{jc} = \frac{\pi}{4}(D_{jc}^2 - D_h^2) \quad (16)$$

The above approximation may be used for flat plates. Where the joint is a thick walled tube whose outside diameter, D_t, falls outside the 45° peripheral line, equation (16) may be used, but where D_t begins to fall within this circle, D_{jc} approaches D_{bf} and is defined as:

$$D_{jc} = \frac{D_{bf} + D_t}{2} \quad (17)$$

Equation (17) applies until D_t diminishes to D_{bf}, at which point, $D_{jc} = D_{bf}$.

C. In addition to area corrections, other factors affecting accuracy of formulae are bending and shear deflection which are present in the typical joint. ●

by **P. E. Boron**

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ASSEMBLING CIRCUITRY BOARD FOR AIRBORNE COMPUTERS

A report on design features as well as the role of audio-visual instruction, micro-welding, dip soldering, and adhesive bonding in the assembly of airborne computers.

Utmost quality is the prime requisite of airborne computers designed and developed for use in military aircraft and ballistic missiles. Suffice it to say that computer failure in a military airplane may cost human lives, and computer failure in a missile may cost the success of a missile shot upon which millions of dollars have been expended. In the event of another "hot" war, computer failure could bring about even more serious consequences. Therefore, there can be no compromise with quality.

Obtaining utmost quality in an airborne computer is made more difficult because of the environments and conditions under which the computer must operate during its service life. In addition to what may be regarded as almost fail-proof reliability, the computer must be light in weight. Every pound added to an airborne vehicle, plus the weight of the fuel required to lift and transport that pound, detracts an equal amount from the ultimate payload, whether that payload is bombs, provisions, personnel, or an atomic warhead.

With installation space at a premium in either an airplane or missile, a computer must be as compact as possible. This means crowding many components in a very small volume of space. Naturally this complicates computer assembly. It is much easier to lay out a circuit on an electronic engineer's "breadboard" than to concentrate the same components in an area no larger than a postcard.

An airborne computer must be made effectively resistant to all known environmental conditions. These may vary from the normal, to the steaming heat of jungle areas, to the highly saline conditions encountered in overseas operation, and onward into the frigid void of outer space. Atmospheric pressures on the computer may vary from normal to almost vacuum. The airborne computer must be able to withstand rough handling at times, the strains imposed by rapid acceleration and deceleration and by centrifugal forces. Computer components or "spares" must be able to withstand extended storage at far-flung military bases where storage conditions may be far from ideal.

These computer requirements have been detailed here for the reason that each one affects assembly operations. They explain why we have had to develop assembly operations that differ considerably from operations normally associated with electronics assembly. In each case, this "difference" contributes to one of the airborne computer requirements, whether it happens to be light weight, compactness, resistance to changing environmental conditions, or the ability to withstand shock. The remainder of this article will explain certain Hughes-developed assembly processes and techniques which could be applicable to many types of commercial electronics assembly work.

In designing airborne computers, Hughes electronic engineers placed unusual emphasis on modular construction. Modular construction has several distinct advantages in electronics assembly, testing, maintenance, and operation. To begin with, it is much easier to assemble a single circuit, or a portion of a circuit, than it would be to assemble several complex circuits at one time. It is also easier to obtain extreme compactness in a limited circuit than in a complex circuit.

Secondly, following assembly, the various modules can be checked and tested as individual units. Troubles are therefore localized in the unit being tested, and if not self-evident, can be located with a minimum of circuit tracing. In maintenance work, trouble can usually be easily traced to a single module, then this module can be replaced with a spare, thus cutting computer down-time to a bare minimum.

A third advantage of modular construction (especially in conjunction with computers and similar equipment in which numerous identical circuits are used) is use of the repetitive circuit board module. In one Hughes computer, about 70 such identical circuits are used. Each of these circuits is assembled on identical circuit board modules. Thus one circuit board module can be used to replace any of the others. This not only standardizes and simplifies assembly, but is of vast value in field maintenance work where the number of spare circuit boards that must be kept on hand is greatly minimized.

Two types of circuit boards are used in the Hughes computer—the conventional flat, plug-in type circuit

continued

In assembling electronic circuitry, worker at left is following instructions received by earphone and also flashed on Videosonic screen.

board where the individual components are all mounted on one side. The other is the "cordwood-type" circuit board wherein the individual components are mounted between and enclosed by two circuit boards.

The greatest advantage of the cordwood type circuit board is greater compactness. As any electronics engineer will point out, the number of components that can be mounted on a flat circuit board is limited by the space required for the printed circuitry. When two carefully laid out circuit boards are used (with components sandwiched between them), connections can be made "straight across", so to speak, between the boards. This eliminates the need for time- and space-consuming circuitry runs. This allows more components to be assembled in less space. The circuits on a cordwood type board are brought out to contacts along a single flat edge which "plugs in" just like the contacts along the edge of a flat circuit board.

Both the efficiency and reliability of any electronic circuit depends to a great extent upon how the connections are soldered. Hand soldering provides many opportunities for human error. Too little or too much heat may be used, thus affecting the electrical characteristics as well as the strength of the joint. Too much heat may harm the resin joint between the circuitry runs and the board. Some sensitive components can be harmed by the use of too much heat.

DIP SOLDERING

To avoid these contingencies, Hughes employes a dip soldering process for soldering all circuit board components. The components are first mounted in the plated holes in the circuit board. Then a specially formed cover clamp is used to hold them in place until they are soldered.

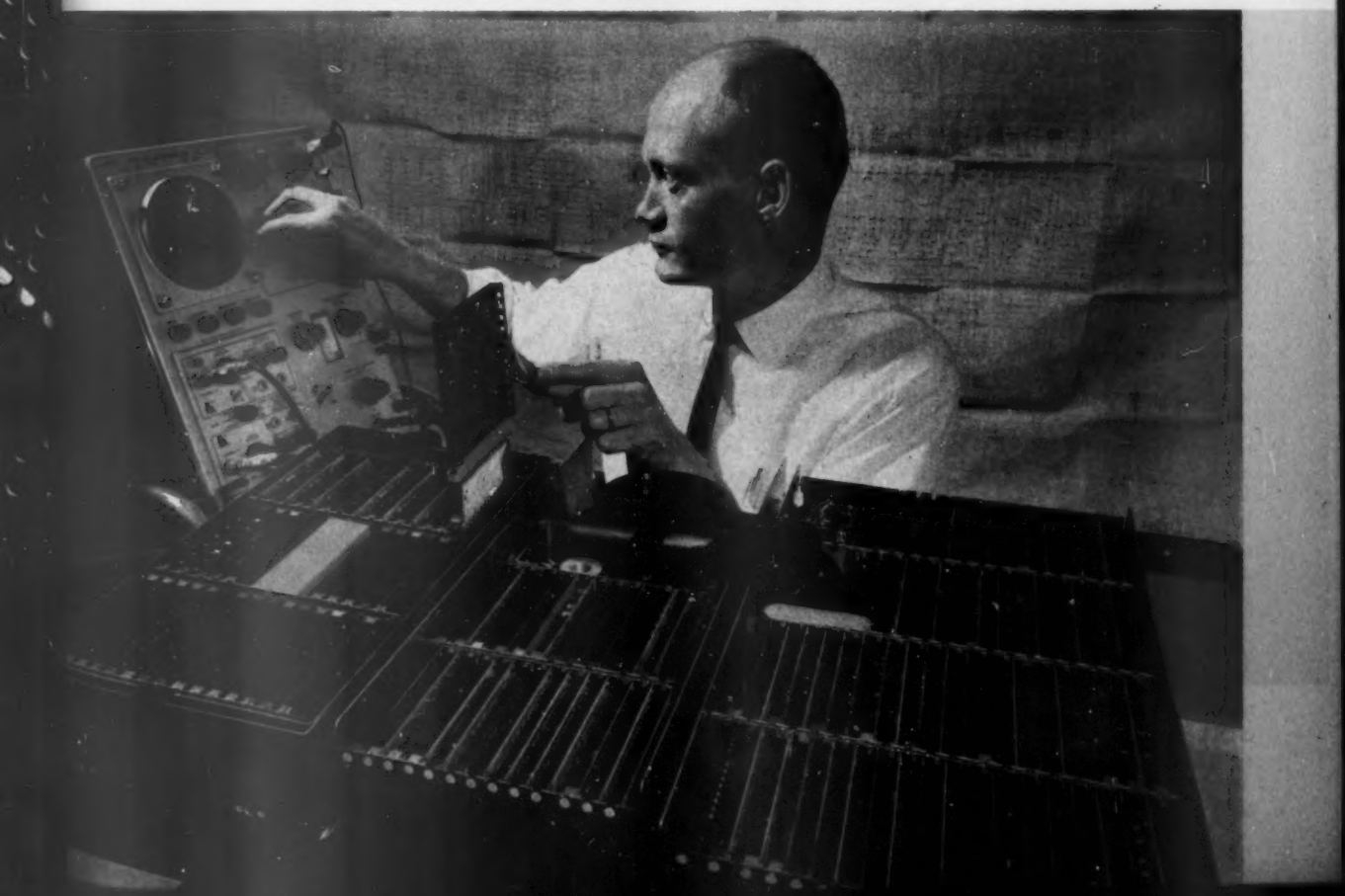
In soldering, the bottom of the circuit board is placed flat against the surface of a molten solder bath. Capillary action causes the molten solder to work up through the plated circuit board holes and around the component leads inserted in them. When the board is removed from the surface of the bath, all solder drops away except that which has been drawn by capillary action into the plated circuit board holes.

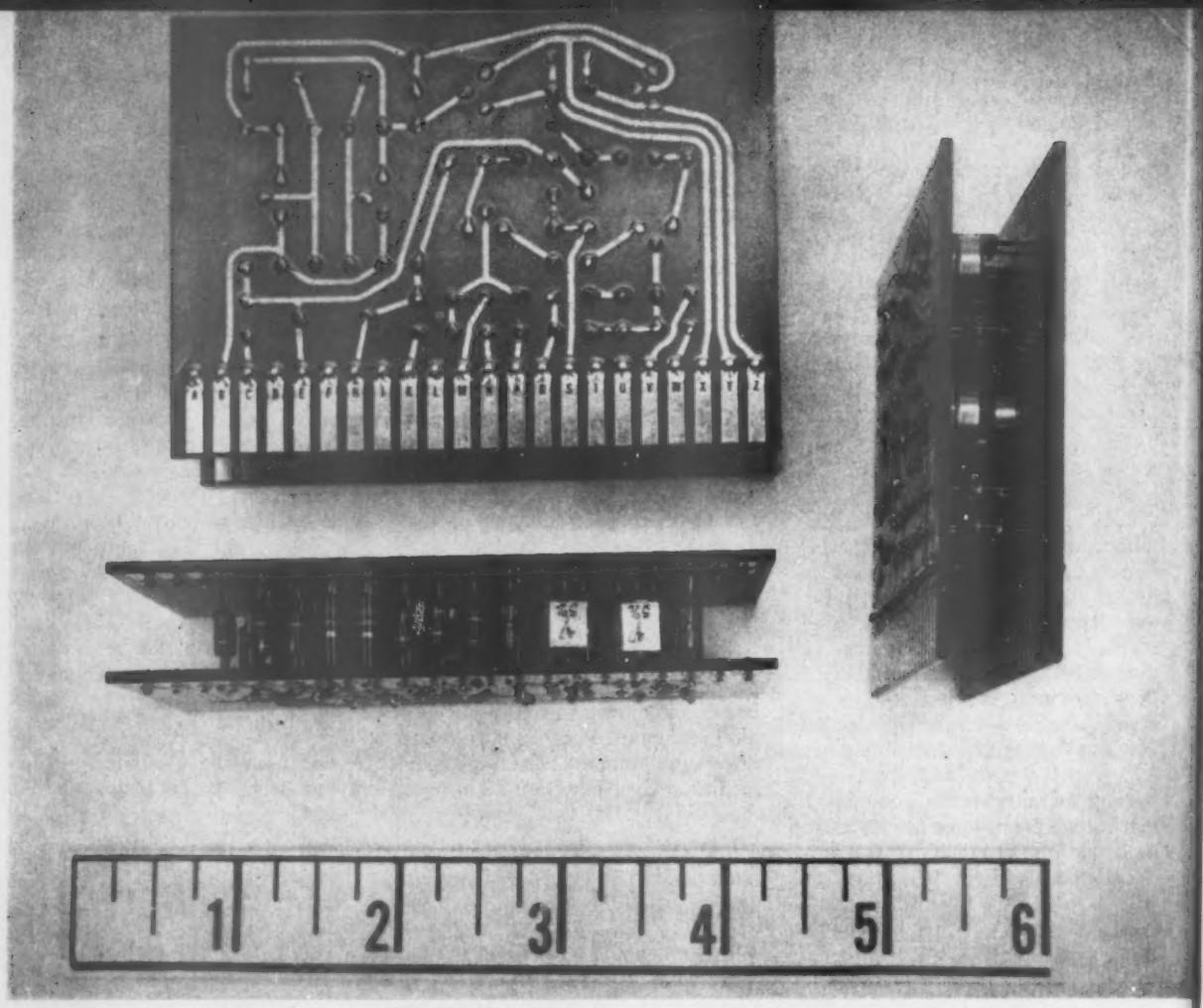
In this process, exact heat control is maintained at all times. As the capillary action is almost instantaneous, contact of the board with the surface of the hot solder bath is very short. Thus, there is little time for heat to be conducted along the component leads and into the component itself. The same applies to the resin bond between the board and the circuit runs. The board itself acts as insulation between the bath and the circuit runs, and not enough heat is absorbed to affect the resin bond.

Because of their extreme sensitivity to heat, special techniques are used for mounting transistors on the circuit boards. On metal power supply circuit boards, special ano-

continued

Typical modules for a Hughes airborne computer. Testing is greatly simplified since trouble can be quickly traced to a specific module.





Electronic components are mounted between two "cordwood" type circuit boards. This permits shorter leads and conserves space.

dized aluminum mounting brackets are used. The anodic coating on the bracket provides the necessary insulation. In other power supply circuits, mica washers coated with a silicone grease are used for transistor mounting.

In mounting transistors on nonconductive circuit boards, plastic transistor pads are used beneath each transistor. These pads provide three advantages. They increase the length of the transistor leads thus minimizing the conduction of heat into the transistor itself; they provide some space between the transistor bottom and the surface of the board so that proper capillary action can occur during soldering; this same space prevents the accumulation and entrapment of moisture under the transistor during its service life.

Another Hughes-developed technique is the use of die-cast aluminum channel strips cemented along the slide-in edges of plug-in type circuit boards. Each channel strip is provided with a riveted stud which, when the circuit board is slipped into place, enters an accurately milled slot in the chassis sidewall. The rivet head is stopped by the bottom of this slot when the circuit board has been slipped in far enough to make the specified amount of contact in the plug-in receptacle. Thus the mounting dimensions between the plug-in board and its plug-in receptacle is limited to the single dimension between the rivet stop and the receptacle. In addition to providing this mounting accuracy, the channel strips also provide additional rigidity for the circuit board itself.

ADHESIVE BONDING

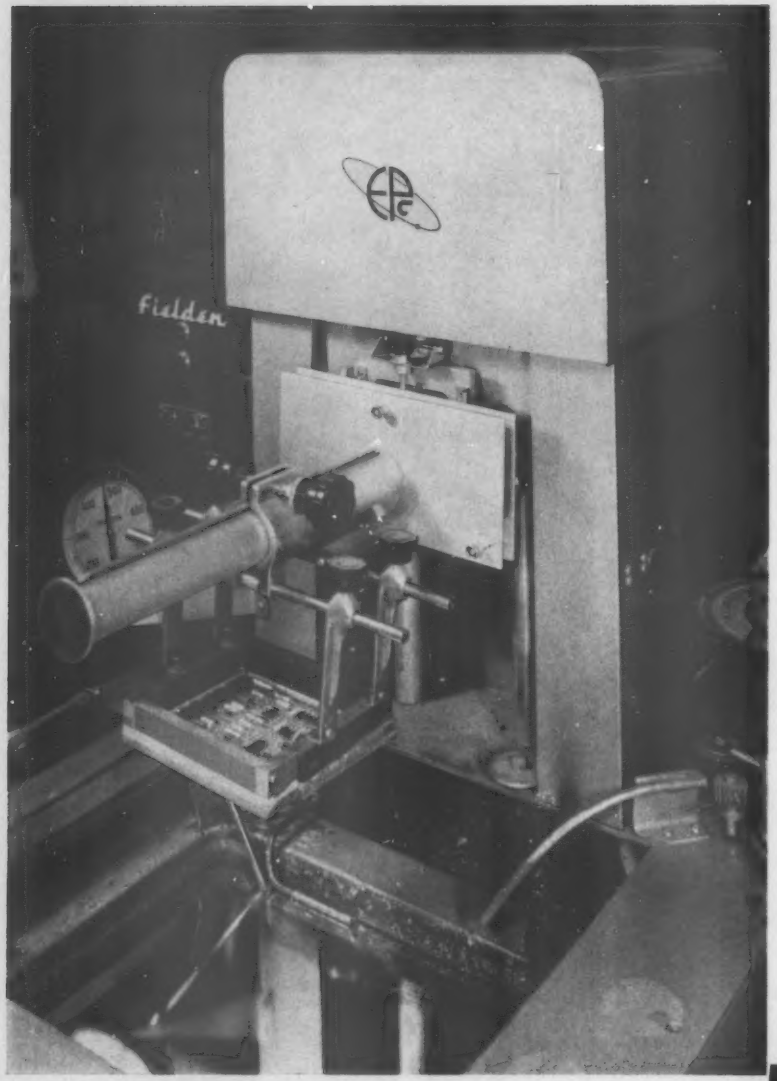
In most cases, the chassis or chassis components for containing electronic assemblies are of spot welded or riveted construction. At Hughes, an epoxy cement is used in chassis assembly. This cement is placed between the surfaces to be bonded, then is clamped under pressure.

Both hot and cold bonding techniques are employed. In cold bonding, the joint is merely clamped under pressure for about 24 hours. In hot bonding, the clamped assembly is placed in an oven at about 200° F. for approximately two hours. While hot bonding is preferred because of its speed, cold bonding is used when the assembly contains any electronic components that might be harmed by the heat of the hot bonding process. In some cases, completed chassis modules may be bonded together to form larger modules.

Though as yet used sparingly, progress has been accomplished in the actual welding of component leads to metallic ribbon. This work is accomplished by a capacitor discharge welder. With this machine, application of the welding heat is

continued

Micro-welding technique is used to join component leads to a continuous metal strip. A capacitor-discharge welder is used. Heat application is instantaneous so that the "hot zone" is limited only to the weld area, causing no harm to the components. As can be seen, this electronic assembly follows the general trend toward miniaturization.



In soldering circuit board components, the bottom of the board is lowered against the surface of molten solder. Capillary action causes the solder to work up through the plated circuit board holes and around the component leads inserted in them.

limited to a few milliseconds. This confines heat intensity to the area of the weld, causing no harm to the components.

As a final innovation, the Hughes manufacturing divisions make extensive use of audio-visual instructions* in many types of electronic assembly work. This company-developed system, called Videosonic, uses a pre-programmed tape synchronized with pictorial slides of the operation it describes. Small tape reproducers and slide projectors are provided at each work bench. When an assembly operation is about to start, the correct tape and slides are inserted in the reproduction equipment. A picture of each assembly operation (or sometimes a picture of a drawing) is flashed on the screen while audio instructions are provided over a set of lightweight earphones. When the assembly operator has finished one operation, a control is actuated, another picture flashes on the screen, and the accompanying audio instructions are given.

This instruction system has proved extremely valuable in all types of electronic assembly work, and exceptionally so in conjunction with the training of new employees, and the transfer of employees from one job to another. •

*See "Will Audio-Visual Systems Obsolete Straight-Line Assembly," November 1960, Assembly & Fastener Engineering.

Epoxy adhesive is applied on a chassis component prior to bonding. In cold bonding a liquid-type adhesive is used; in hot bonding an adhesive in ribbon or tape form is used.

PART 2

SELECTING power drivers for threaded fasteners

The author further discusses clutches and some typical air tool applications.

by **Paul Van Sittert**
Director of Research
The Rotor Tool Company

In the previous issue we outlined three yardsticks for use in selecting a power driver to fit the job. These yardsticks considered the nominal diameter of the fastener, its torque requirements, and the permissible variations in final torque. In addition, one common jaw clutch construction was discussed.

In this issue other clutch mechanisms are considered, as well as other components and accessories essential to the successful application of power drivers. Several typical examples illustrate the selection process.

One of the most serious obstacles in attaining uniformity of torque is the variations in flatness of the members being clamped by the fastener. Where this flatness runs uniform from joint to joint, the angular twist during final tightening remains fairly constant, and quite precise torques are fairly easy to attain with any one of several types of drivers. But where the flatness of the work varies considerably from joint to joint, the angle of

continued

Fig. 5: Small screwdriver with positive clutch and external quick-change chuck eliminated need of four different tools to drive various fasteners at this assembly station.

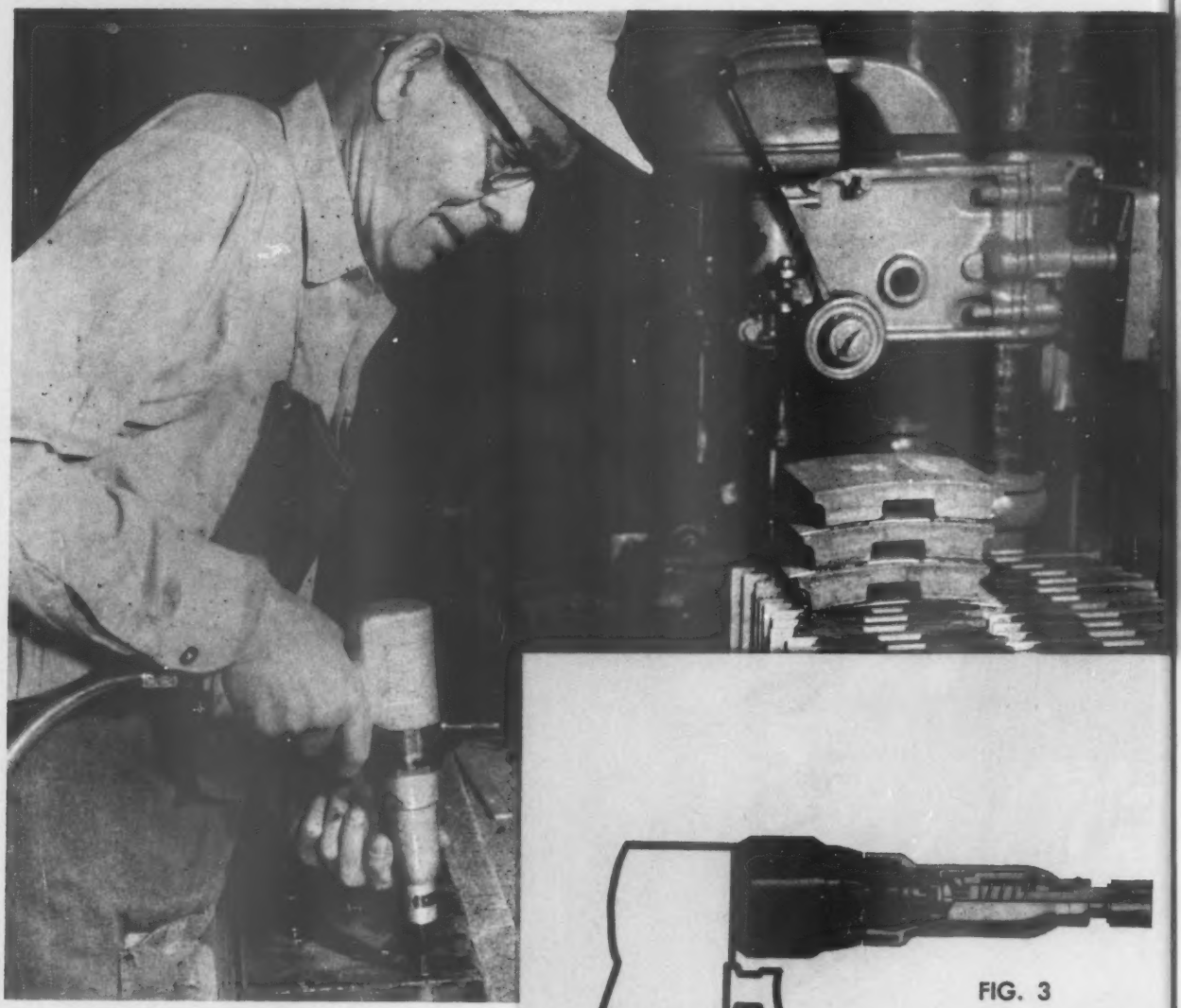


Fig. 6: A medium size screwdriver with a cushion clutch provided the required torque accuracy with a minimum torque reaction. This job was speeded up to provide a 30 per cent saving over previous methods.

THREE COMMON CLUTCHES

At the right are illustrated three types of clutches discussed in this two-part article. The positive clutch (Fig. 2) was described in Part I. The ball-type cushion clutch (Fig. 3) and the torque-limiting clutch (Fig. 4) are discussed on the following pages.

FIG. 3

FIG. 4

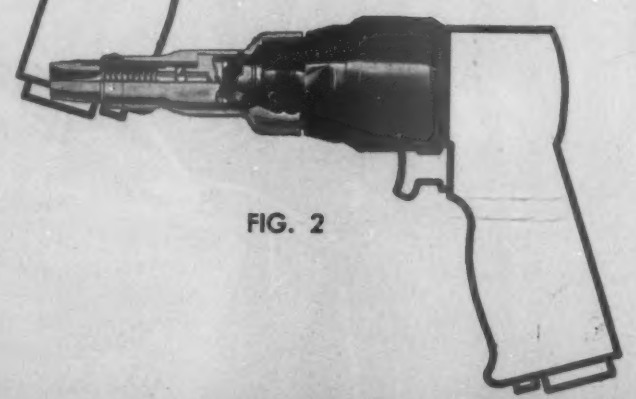


FIG. 2

twist during final tightening will vary more and difficulty may be experienced in meeting the torque tolerance regardless of the type of driver used. We have already mentioned the momentum effect of stall-type air motors, and we can now readily see how variations in flatness would affect the cushioning or dissipation of this momentum to produce a wide variation in torque even with closely regulated pressure driving the air motors. The same tendencies persist in varying degrees with several other types of drivers, some of which we will now consider.

CUSHION CLUTCH

One very popular type of driver construction is called a cushion clutch (see Fig. 3). In principle it is similar to the positive clutch except that an adjustable spring is used to hold the clutch members in engagement instead of depending upon thrust furnished by the operator. Sloping faces are provided on the clutch teeth; or an alternate construction uses steel balls in one of the clutch members so that the balls can shift and keep presenting a new surface rather than confining the disengaging action to the same surface continually. After the clutch members have disengaged, some additional rotation will permit re-engagement; thus if the operator permits the clutch to disengage and re-engage alternately, additional momentum is transferred through the clutch mechanism in an action similar to that of an impact wrench. The additional tightening after the initial disengagement depends upon the number of such re-engagements, the weight of the pieces which must move to permit disengagement, and the spindle speed. If the spindle speed is slow and the weight of the pieces which must move to permit disengagement is small, considerable torque accuracy can be achieved even if the flatness of the work varies considerably. This is because if the fastener is not tight enough at the first disengagement, succeeding impulses can bring it closer to the desired tightness. On the other hand if extensive impacting of the clutch is permitted, frequent readjustment of the torque setting, or replacement of worn clutch parts may be required.

In adjusting cushion clutches it may be possible to tighten the clutch spring to a point where the torque necessary to disengage the clutch exceeds that delivered by the air motor, especially if the air supply is delivering less than rated air pressure to the motor. In such an event the motor will stall without disengaging the clutch. On a large tool with high torque, this condition may be dangerous, especially if the shock comes by surprise. On the other hand if the job is such that the fastener tightens abruptly, then the momentum developed by the rotating parts of the air motor may generate sufficient momentum to cause disengagement of the clutch even when adjusted for a higher torque setting. The consequent impacting effect can produce fastener torques in excess of the stall torque of the motor without a clutch. In such applications, high impact stresses can cause breakage, and shorter clutch life can be expected. When impacting is relied upon for tightening, the number of impacts determines tightness, so torque control here, as with the positive clutch, depends upon an operator's skill.

TORQUE LIMITER

Another type of clutch construction is a modification sometimes called a torque limiter (see Fig. 4). This device is roughly similar to the cushion clutch, except that after the initial disengagement the motor remains disengaged, and no further driving relationship is possible until the tool has been removed from the work. Since disengagement occurs only once per fastener, the durability of the clutch parts is much greater and readjustment of the clutch setting needs to be made much less frequently.

On the contrary, variations in flatness of the work tend to produce even more variations in the fastener tightness, because the tool has no chance to try again after the first disengagement. Thus jobs where the fastener tightens abruptly usually have satisfactory tightness, while those which tighten more gradually are apt to be low in torque. Where the work runs uniform, torque variations may run as close as $\pm$ 2%, but where the work varies widely, variations in torque may run $\pm$ 25 to 30%. If torque accuracy is a prime requirement, slow spindle speeds will minimize these differences caused by non-uniformity in the work.

We have already noted that when a fastener is tightened with an impact wrench the torque continues to increase, usually until the fastener breaks or the threads strip. In some cases the fastener tightens so rapidly the operator hardly has time to shut off the tool before over-tightening occurs. Some improvement can usually be effected in such cases by operating the impact wrench on reduced air pressure. Another alternative would be to use the next smaller size impact wrench.

Several attempts have been made to equip impact wrenches with a device which would interrupt the tightening process when the fastener had attained a predetermined tightness. At least two such devices are currently on the market. Where the work runs sufficiently uniform that the fasteners tighten with about the same degree of suddenness, consistent results can be obtained with these devices. Where the work varies widely the torque accuracy is likely to be unsatisfactory, and results may be comparable to those obtained with torque limiters.

In addition to the observation made earlier concerning the relation of motor speed and gear ratio, we should add something about the relation of speed to desirable operating characteristics. Sometimes the fastener is held in the tool magnetically or mechanically, then the tool along with the fastener is placed on the work. Another arrangement is also used frequently where the fastener is started in the work and the tool must then "find" the screw. The former situation applies more often to a socket screw or one with a hex head. The latter case is common with slotted screws. It is not usually practical to find the hex hole in a socket head cap screw with a hex driver on the tool. The finding of the slotted screw can be successfully accomplished at amazing spindle speeds. It is much easier to do so however, at speeds ranging from 500 to 2000 rpm.

Another matter similar in character to the finding of the screw

continued

concerns the auxiliary clutch which permits the spindle to remain stationary when the tool is not on the work, though the motor is revolving. In the case of a positive clutch driver this would be the positive clutch, but in the case of a cushion clutch driver or a torque limiter it would be a separate clutch. Engagement of these clutch jaws is very difficult if spindle speeds are too high. Most convenient speeds are from 500 to 2500 rpm. While somewhat higher speeds can sometimes be managed, nibbling at the corners of the clutch teeth is likely to occur with rapid deterioration of the clutch faces.

TYPICAL APPLICATIONS

Application examples could be multiplied indefinitely. Some typical cases will help show how selection yardsticks can be used.

A manufacturer of portable room air purifiers needed power tools to assemble these units. The same operator attached the cover panels, rubber legs and associated parts, using different sizes of slotted machine screws and nuts as well as hex head sheet metal screws. All of the fasteners were 1/4 nominal diameter or smaller. A small screwdriver having a non-reversible motor, 900 rpm spindle gearing and positive clutch was selected as best suited to the job (as shown in Fig. 5). The torque reaction of this tool was not objectionable. By varying the thrust of the tool against the screw, the operator was able to obtain suitable tightness in the various size fasteners used. Torque tolerances were not critical. An external quick-change chuck permitted rapid change of bits and finders to fit the different fasteners. Substantial savings resulted from this selection, since the different fasteners involved would normally require four different tools.

CUSHION CLUTCH

Another manufacturer assembled brake segments with 1/4"-20 flat head machine screws. Since this job falls in the middle size fastener range, stall motors and impact wrenches were considered in addition to medium-sized screwdrivers. Stall tools yielded an objectionable torque reaction. Torque tolerance ± 10% was difficult to hold when using impact wrenches. The medium-sized screwdriver with reversible motor, 1600 rpm spindle gearing and cushion clutch afforded satisfactory operation without hand tightening. The cushion clutch mechanism compensated for variations in flatness of the work. Only occasional spot checking for tightness was necessary. The tool selected is illustrated in Fig. 6.

IMPACT WRENCH

A welded steel fabricator wished to attach flanges to a welded structure with 5/8" and 3/4" bolts. An impact wrench of the proper capacity provided the best solution for this job. Torque tolerances were not critical. By gauging the impacting times, and letting the wrench hammer the larger bolts a fraction of a second longer, the operator was able to attain the required tightness for both sizes. This was because flatness was sufficiently uniform so that minimum skill was needed. Torque reaction was negligible and substantial savings were indicated compared to previous assembly method.

TOOL ACCESSORIES

In addition to specifying the right tool for a particular fastener application, it is also important to specify the proper adapters, fittings and accessories. Many screwdrivers are furnished with bits and finders built into the assembly. The design is usually flexible enough to permit quick interchange of elements to fit the particular fastener in question. Where the same tool is used for two or more driving jobs alternately, it may be more convenient to use the external chuck arrangement instead of the one where the components are all housed within the main assembly. Accessories like bits and sockets containing permanent magnets are a welcome addition on many jobs where dropped screws or nuts might otherwise waste valuable time.

Cushion clutches and torque limiters are frequently designed for the interchangeable use of various springs and sometimes different weight clutch components to vary the impacting effect of the clutch mechanism. As mentioned before, the selection of the clutch spring should be made so as to keep the disengaging torque of the clutch unit within the torque capacity of the motor and gear train combination if danger of stalling is to be avoided. Heavier impellers enhance the impacting effect more on higher speed spindle tools than the same impeller would on lower speed tools. Some balance should be preserved between the spring used and the impeller weight even where intensifying of the impacting effect is desired. This balance is necessary to return the impeller to its proper position prior to receiving the next impulse.

The assistance of the application engineer representing the power tool manufacturer can be invaluable not only in suggesting the proper tool for each application, but also in specifying interchangeable components and accessories.

SUMMARY

In conclusion, we can summarize by saying that while there are no iron-clad rules we can lay down for specifying the correct power driver for an application, there are several yardsticks which will guide us.

No. 1. The nominal size of the fastener provides a clue. Use screwdrivers up to 1/4". These may be with or without clutches of various types. From 1/4" to 5/8", use stall type air motors or clutch type motors or angle tools or impact wrenches. Above 5/8", use impact wrenches.

No. 2. Select tools according to the torque needed. Motor with gearing must deliver adequate torque unless impacting is permissible. The motor manufacturer can suggest the combination with the appropriate torque.

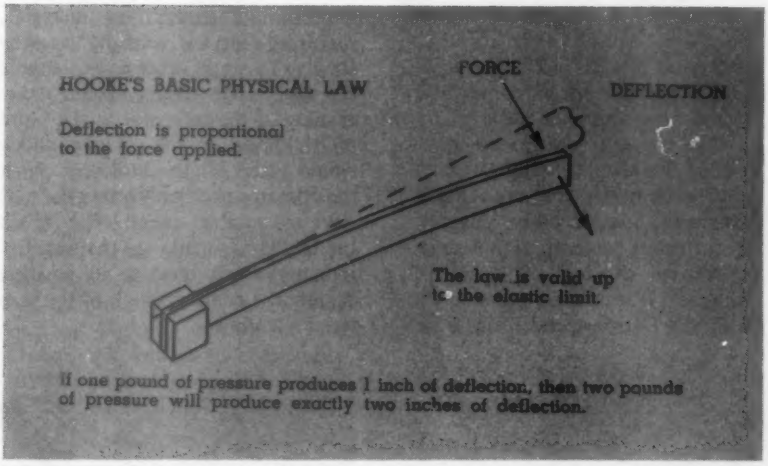
No. 3. Choose driver to hold the necessary torque tolerance. Stall tools, clutch tools and impacts each have their own fields of use. Variations in the assemblies themselves may necessitate trying several different types.

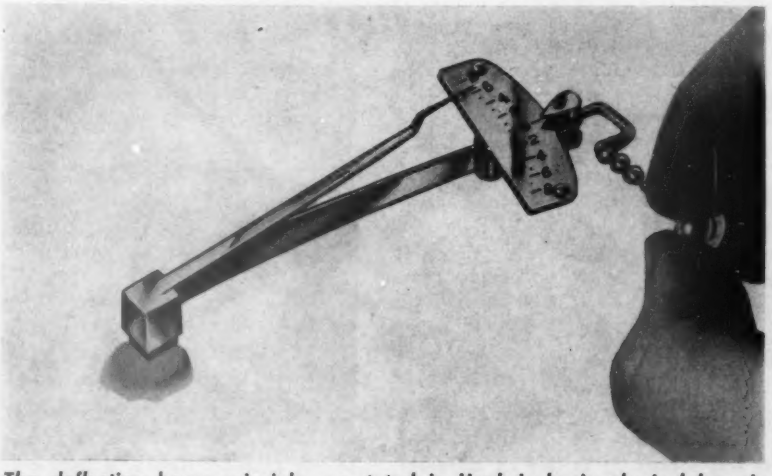
No. 4. Where non-uniformity exists in the work (and this is the case more often than not) and torque accuracy is of prime importance, use as slow spindle speeds as economically practical.

Proper selection of fittings and accessories is important. Help from the portable power tool manufacturer's application engineers can be invaluable.

PRODUCTION TESTING OF JOINT STRENGTH

The role of torque wrenches and fixtures in testing basic materials or sections joined in almost any conceivable manner.


HOOKE'S BASIC PHYSICAL LAW
Deflection is proportional to the force applied.
FORCE
DEFLECTION
The law is valid up to the elastic limit.
If one pound of pressure produces 1 inch of deflection, then two pounds of pressure will produce exactly two inches of deflection.



The deflecting beam principle, as stated in Hooke's basic physical law, is incorporated in one form or another in most torque wrenches used today.

by **Tom A. Green**
Field Service Engineer
P. A. Sturtevant Company

Back in the days when gasoline engines were delivering one horsepower for every 30 pounds of their own weight, there were few specifications for bolt tightening, except for something like, "Tighten it as much as you can with a 10-inch wrench."

Today, with engines producing an output of one horsepower per pound of weight, the stress rates of fasteners have gone up almost in proportion. This can be considered an indication of what is expected of fasteners associated with almost any end-product today.

In order to assure a quality fastening, you must know that the connection between two or more parts is a proper one. The joint may be bonded or fastened in any one of a number of ways. But regardless of the fastening technique, testing or considering torque requirements is today a necessary function. It is as important to design as to production.

A visual inspection of a group of products which came off the same assembly line on the same day may indicate that all the fasteners are holding properly. However, a check of the tension of these small but important components may disclose as

continued

much as a 300% difference in effective holding ability from one to another.

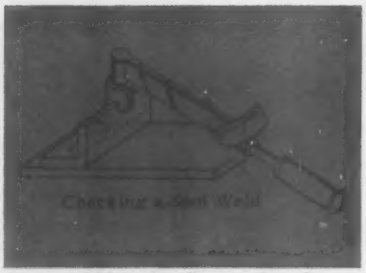
Proper fasteners for a job, proper lubrication, and consideration of surfaces which mate with the fasteners must be considered in order to avoid faulty fastenings. And testing—or measured application—can provide the proof required for a reliable fastening, whether the concern is for torque, tension or compression.

First, let's consider torque. This turning force can be converted by simple mechanical means into any of the aforementioned reactions. This, of course, brings us to the basic measuring instrument—the torque wrench.

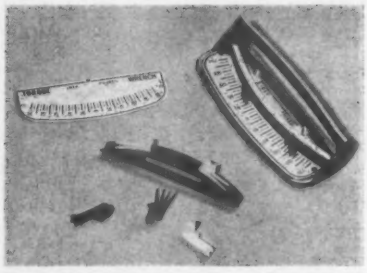
Almost all torque wrenches used today incorporate the deflecting beam principle in one form or another. For this, advantage is taken of Hooke's law which says in part, "If the load is doubled, the deflection is doubled." This principle is utilized in its purest form in the torque wrench illustrated here.

When we consider the measurement of materials in tension, the torque wrench is the appropriate reading device. Such wrenches are available for applying a measured turning force from as low as 20 inch-grams to as high as 2000 foot-pounds (with multiplier).

Using a torque wrench as the reading device, fixtures of the type illustrated can be used in the production measurement of materials in tension or compression. Such fixtures can aid in checking basic materials or sections fastened in almost any conceivable manner.



Spot welds and adhesive bonds can be tested with a torque wrench as well as mechanical fastenings.

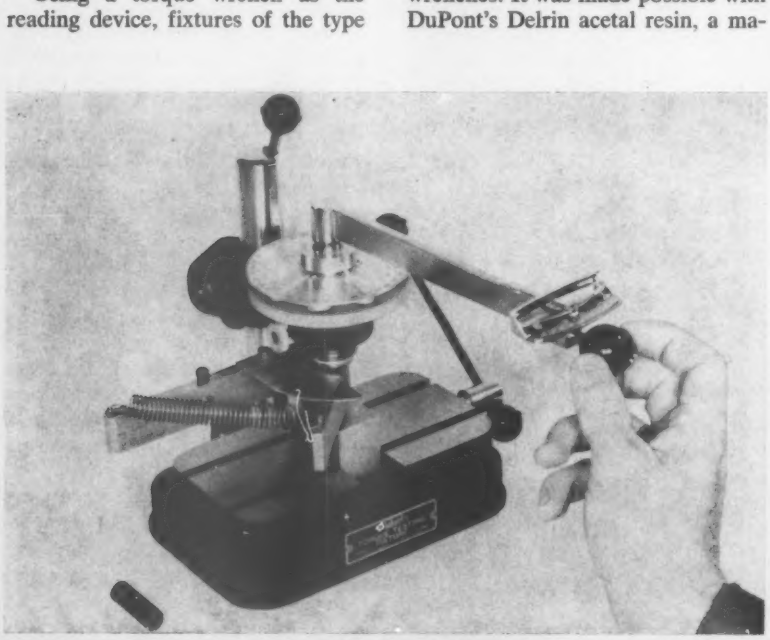


Memory fingers (foreground) are new development which facilitates more accurate torque wrench reading.

An example of the versatility of such fixtures can be visualized in the illustration showing the testing of a spring. With this fixture, a total of 14 different parts were tested to a total of 18 specifications. The parts tested included tension springs, torsion springs, compression springs, and small gear sets.

Research into improving testing devices is keeping pace with industry's demands for more precise fastenings. Just recently, engineers at Sturtevant came up with a simple "memory device" for torque wrenches. It was made possible with DuPont's Delrin acetal resin, a material which requires no lubrication during service. An accompanying photo shows the memory fingers (shaped like miniature clothes pins) with scale and track components.

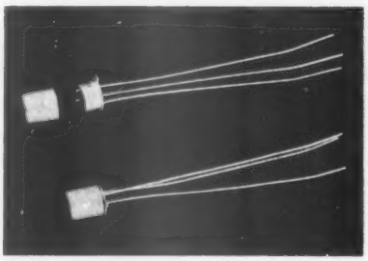
The importance of this device is that it decreases test time while increasing the accuracy of the torque wrench reading. In the past, using a direct-reading wrench to check the ultimate strength of materials required that the part be stressed slowly. This was necessary to enable the operator to recall the exact reading of the indicator at the point of yielding—as the sudden shock would often jar the indicator. Now the operator need only stress the part with reasonable speed, after which the reading is made via the memory indictor which remains in position despite the sudden shock of the material yielding. •



This fixture along with other attachments was tooled up to test 14 different items to a total of 18 different specifications. The particular test shown here is concerned with a spring in tension.

In this push-off fixture, a gear-and-shaft unit is being thrust-tested to its ultimate strength.

RCA welds transistor parts in controlled atmosphere



High-speed welding is tied to strict quality control program

The primary goal of production personnel at the Radio Corporation of America, Somerville, N.J., is to increase transistor yields. With their quality control program constantly being upgraded, and with production demands just a step or two ahead of output, this is no easy job. Furthermore, transistors are quite small and sometimes offer difficult fabricating and assembling problems. Welding used to be one of them, but with some assistance from an equipment supplier, Thomson Electric Welder, they have resolved it.

Using a finger magnet, operator loads transistor parts into welding machine. In joining the can to the base, the weld must provide a perfect seal.

WELDING CRITERIA

Actually, the most important welding operation in the production cycle of a transistor is joining the can to the base, or header. If this miniature product is to function properly, the weld, which is concentrated in a line contact, must give a perfect seal. The welding process has to be done inside a controlled atmosphere chamber to insure that no moisture is trapped under the can.

Any slip-up in technique or malfunction in the equipment will show up in quality control tests. Every transistor is checked under its rated conditions. On a sampling basis, some are given a leak test. Before being joined to the header, cans are filled with a substance that glows under ultra-violet light. After being welded they then are tested accordingly.

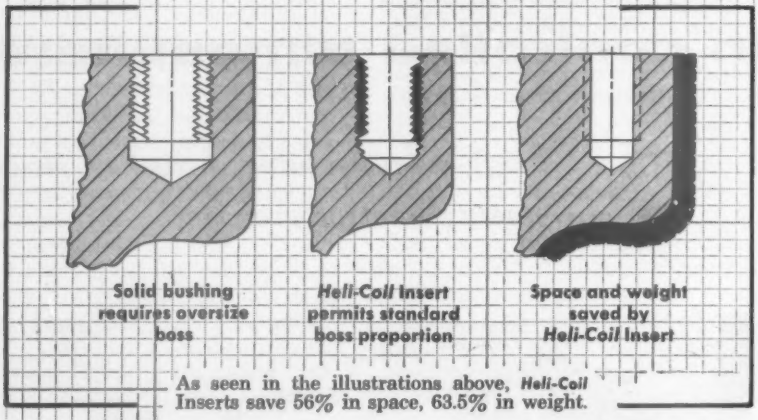
The fact that RCA welds huge quantities of transistors every day under these conditions can be better appreciated by examining the components. A can for a TO-5, for instance, measures only .1875 inches in diameter and in height. It is formed with a small circumferential lip at the open end. Mated with the header before welding, the lip rests on a small inverted v-shaped projection formed on the base surface. When welding the parts, parallelism between the contacting surfaces is within 0.001 inches.

Emphasis currently is on a two-column, direct-tension projection type that is replacing C-frame units. Many of the new units were custom designed to specific applications and floor space requirements by RCA equipment development engineers in conjunction with Thomson design engineers. One model machine, a 30 kva unit, typifies these. Accommodated in an area of 14 square feet, it is packaged unit, complete with the dry-box chamber. The moving parts of the welding head weigh only three pounds to give minimum inertia.

A weld pressure of 700 pounds is initiated from an air cylinder

continued

How You Can Save Boss Space and Weight in Thread Design ...with HELI-COIL® Inserts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Heli-Coil Insert permits standard boss proportion
Space and weight saved by Heli-Coil Insert

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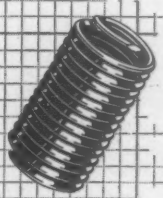
Heli-Coil stainless steel wire inserts have a smaller outside diameter than any solid bushing. Therefore, with ***Heli-Coil*** Inserts you can design boss radii to a minimum, yet stay with standard boss configurations. This means *savings in space and weight*, and material-savings as well.

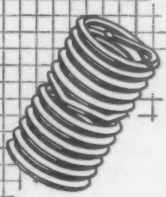
This feature is vitally important for miniaturization in aerospace design, in electrical and electronics equipment design, and for general industrial applications.

NO OTHER TYPE OF INSERT OFFERS SUCH SAVINGS!



Heli-Coil Standard Insert
for stronger, smoother, lifetime threads

Permanently protects threads against wear, stripping, corrosion, galling, seizing, vibration, and shock. Made of 18-8 stainless steel wire, this precision-formed ***Heli-Coil*** Insert has a tensile strength of approximately 200,000 psi. Conforms to military standards and all commercial and industrial thread forms.



Heli-Coil Screw-Lock Insert
eliminates lock wiring and lock nuts

This one-piece wire Screw-Lock Insert provides all the thread protection of the Standard Insert, PLUS an exclusive resilient *internal* locking feature that eliminates clumsy protruding lock nuts, lock wiring and other supplementary locking devices. *It saves cost, space and weight* — permits simple streamlined design in standard bosses. Meets military and N.A.S. specifications for locking torque and vibration.

The ***Heli-Coil*** *line of products includes: inserts and related taps, hand tools, power inserting tools, automated tooling, and gages. Tables of boss radius and weight comparison are available. Write for complete details and design data.* 2561A

HELI-COIL CORPORATION
3104 Shelter Rock Lane, Danbury, Connecticut
In Canada: ARMSTRONG BEVERLEY ENGINEERING LTD.
6975 Jeanne Mance St., Montreal 15, Que.

Use postpaid card. Circle No. 222

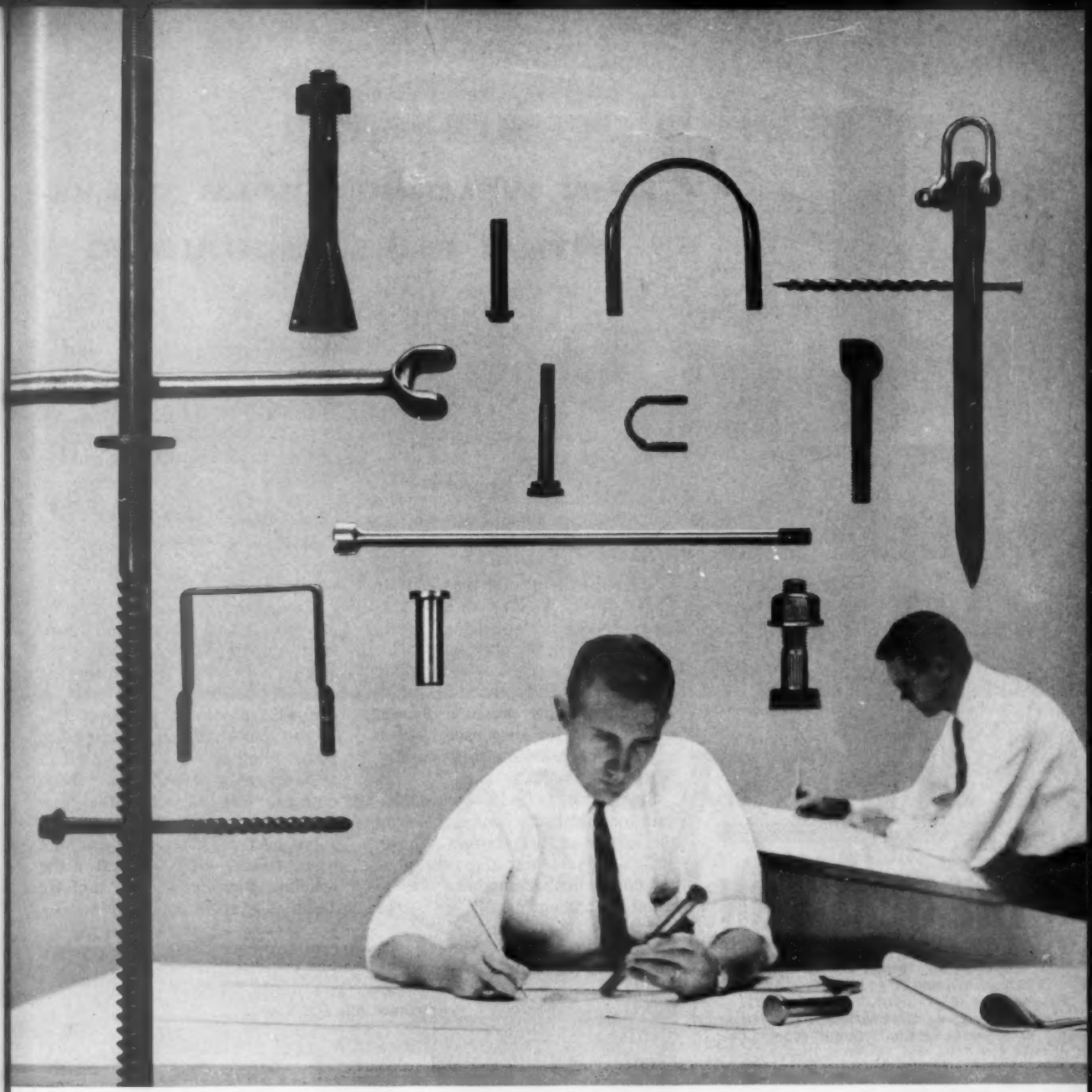
mounted directly above the upper electrode. Due to the small mass represented in the cylinder and the low frictions, fast follow-up is obtained.

Each production welding station in the plant is designed to be highly self-sufficient. From a stock of parts located in an adjacent storage bin abutting and accessible from the dry box, the operator picks up the components, loads them in the welding dies using a small magnet slipped over one finger. The welder is energized through palm switches after which the assembly is transferred to a vestibule adjacent to the machine. The entire sequence is performed inside the dry box. The operator has access into it through two rubber seals shaped like gloves.

Both the welding techniques and equipment that contribute to RCA's high production yields are always subject to change simply because the field of electronics is changing so rapidly. It seems that each new development brings in high levels of quality and greater production demands.

Alert to such development, RCA personnel are trying out new welding equipment, including an integral low inertia die assembly. Dial table arrangements are being re-evaluated. And as other possibilities arise, they will be scrutinized closely. It is part of a continuing effort to improve yields and lower costs. •

"Seen anything of a missing link, Sam? --er--, excuse me!"



Bethlehem makes "specials" to your specification.

And we often cut costs by redesigning to improve the product.

Steel

for Strength
... Economy
... Versatility

Every one of these specialty products was made for a specific application from drawings or specifications supplied by our customer. Translating your design into a finished part is seldom easy. But if the job can be done . . . Bethlehem fastener engineers can do it.

Let us know what you need. Our fastener engineers will study your requirements and give you an honest answer on what we can do. For more information call the nearest Bethlehem sales office. Or write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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THE HEAT'S ON

And difficult fastener problems are solved

New one-step, "touch and go" blind expansion riveting takes just a touch of heat and the job is done . . . *instantly!*

Developed by DuPont, this new idea in fasteners is safe, simple and economical. All you need is a soldering iron.

- One unskilled operator can set up to 25 per minute.
- Fasten metal, wood, rubber, fibreboard, plastic, tubing, etc.
- No expensive tooling — all you need is a soldering iron.
- Safe, positive sealing; shank expands along full length for wider grip range.
- No finishing operation required.
- Simple, one-piece design.
- Brazier or countersunk head.
- Available in brass, chrome plated brass, aluminum, stainless steel.
- Tamper proof.

Send for details

THE BOWMAN PRODUCTS CO.

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Exclusive distributors:

DUPONT Industrial Blind Expansion Rivets

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SPIN WELDING SEALS VALVE WITHIN PLASTIC HOUSING

by **Rudy Mate**
Associate Editor

How do you seal a small valve within a plastic housing when the two parts of the housing won't take a bonding agent? The answer is spin-welding the plastic cap onto the body after the valve has been inserted.

This problem and its solution came about when the Controls Company of America sought an answer to the problem of metal valves corroding in the presence of liquid chemicals. Specifically, it was concerned with low pressure diverter valves used for dispensing bleach and detergents in automatic washing machines.

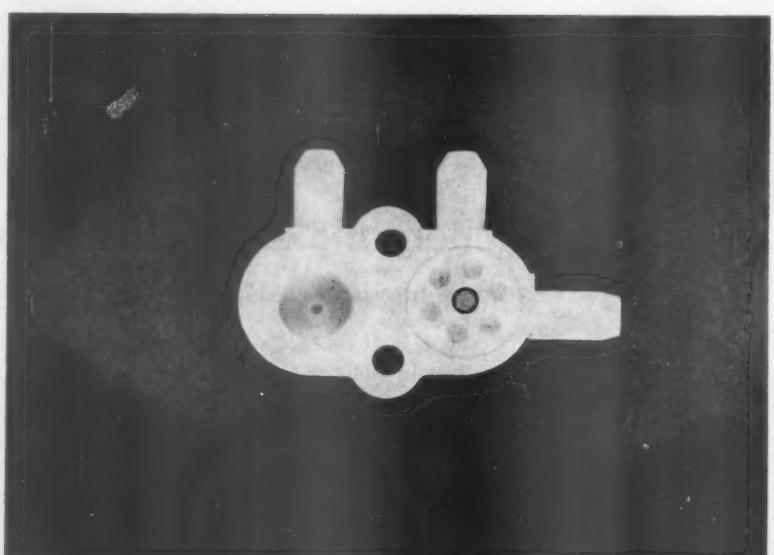
In an effort to find a stable substitute for metal, the company sought the advice of neighboring Whitso, Inc., a manufacturer of molded plastic parts. Both companies are located in Schiller Park, Ill.

To use a material with the required properties, Whitso went to a new design for the valve and an acetal resin plastic made by DuPont. Called Delrin, the plastic has good dimensional stability, low permeability, is solvent resistant and has close tolerances on thin walls.

The intricate valve housing is injection molded in one piece. It is held to such close tolerances that the seatings require no further machining.

Completing the assembly requires another interesting operation, that of spin welding. After the valve assembly is placed in the housing; the seal, also made of acetal resin, is spin-welded onto the sealing seat.

The spin-welding is accomplished by spinning the seal at a speed of approximately 18000 rpm. Pressed onto the seat and allowed to spin for a few seconds, friction causes a hot melt of material at the joint which freezes with the arrest of the spinning parts, yielding a uniform and high strength bond. •



One of two stainless valves has already been spun sealed inside plastic housing of a low pressure diverter valve used for dispensing bleach and detergent in automatic washing machine.

if you operate cold headers

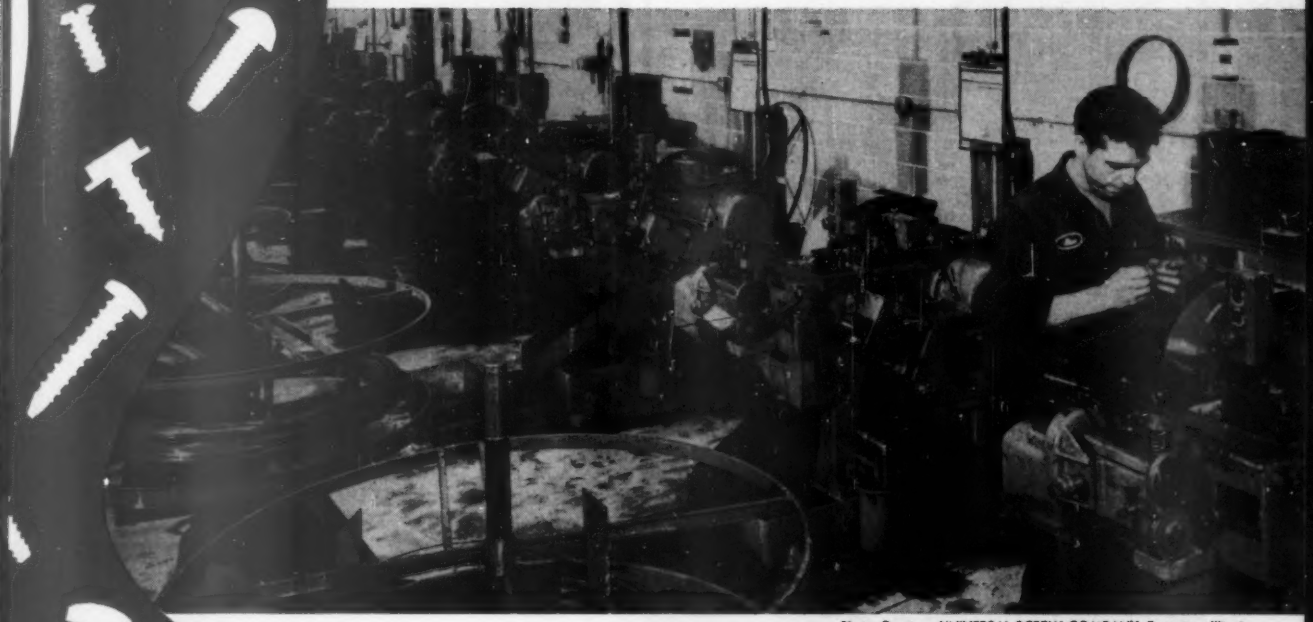


Photo Courtesy UNIVERSAL SCREW COMPANY, Evanston, Illinois

EXTRUDOIL #51 DO Concentrate is for you...

If you're interested in RESULTS, not just promises, you owe it to yourself to find out why Macco Extrudoil #51 DO Concentrate is *THE LUBRICANT* for cold heading. In plant after plant, throughout the fastener industry, it is being used, every day, for high volume, high quality production. REASON? Experience has dictated that Macco Extrudoil #51 DO Concentrate is the one lubricant that does the job best! It's that simple. Get all the facts and a trial from your Macco engineer. You'll see the many advantages other fastener manufacturers are now enjoying.

HERE ARE JUST A FEW OF OVER 35 DIFFERENT MACCO PRODUCTS COMPOUNDED WITH SPECIAL ADVANTAGES FOR FASTENER MANUFACTURERS

Mac Draw #169
Tube Lube "B" • H.D. #14-C
Bio-Coat
Steel Kleen • R.P. #10-A
D. & R. Compound #10-A
Burnishing Soap #6-A
Macco #472-MPA
Tumbling Compound #43-F

THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

CLEANING COMPOUNDS
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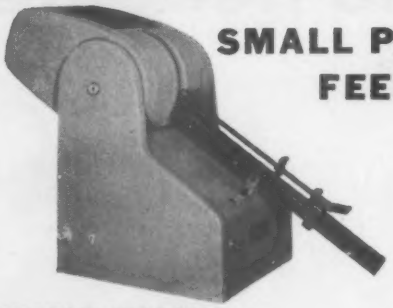
HOPPERAL



SMALL PARTS FEEDERS

SINGLE TRACK

Automates your operation by continuously supplying parts which are properly oriented for machining, assembly and packaging. Gentle oscillating action of "HOPPERAL" assures trouble free feeding of parts. Unit shown has adjustable escapement to release one or more parts at a time.

REDUCE ASSEMBLY COSTS

MULTIPLE TRACK

Available with any number of tracks to feed parts to assemblies or other operations where a large quantity of parts is required simultaneously. Can be partitioned and supplied with properly designed tracks to feed unlike parts.

HOPPERAL DRIVER

A bench press with built-in parts feeder to provide a continuous supply of small parts properly oriented for staking, press fitting, peening and riveting.

The Hopperal parts feeder will feed screws, nuts, bolts, rivets, nails and other fastening devices for many assembly operations.

Write for brochure on automated feeders and assembly machines.

HABERSTUMP-HARRIS, INC.

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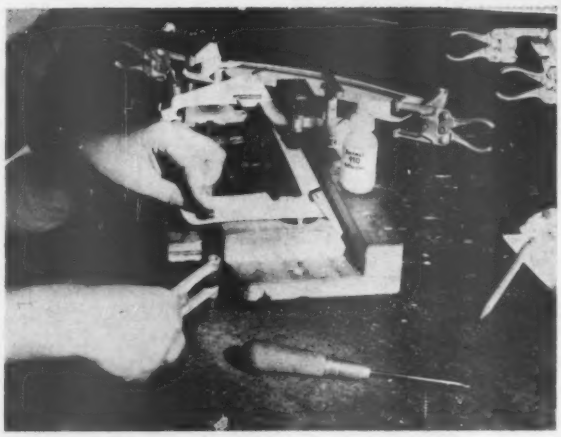


Here vinyl cleats are bonded to molded acrylic key lever mask with a drop of adhesive. The parts are clamped together for eight minutes to assure a proper set.

FIND NEW ADHESIVE USES IN TYPEWRITERS

In the assembly of Galaxy portable typewriters, engineers at Smith-Corona Marchant, Inc., Groton, N.Y., have found some new adhesive uses. Bonds are made in these five applications: vinyl to acrylic, butyrate to acrylic, vinyl to melamine-coated aluminum, vinyl to steel, and anodized aluminum to enameled aluminum.

In one application, an anodized aluminum nameplate is bonded to a recessed location in the enameled aluminum top deck of the typewriter. Six drops of adhesive are spread over the recess and the nameplate is positioned with a slight pressure of the fingers.

For another application, tiny vinyl retainers are bonded to the paper bail, a long narrow half-cylinder of extruded aluminum sprayed with a melamine coating. These retainers hold a steel shaft which, in turn, carries small rubber rollers that press the paper tightly against the rubber platen. A drop of adhesive is placed on two areas of the bail and the vinyl retainers are set in place with the aid of tweezers, while momentary pressure is applied via a screwdriver.

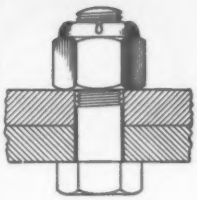
The third application concerns the key lever mask which is an acrylic molding. This mask receives two vinyl cleats which serve to hook the mask to the outer metal frame. A drop of adhesive is used for each of the cleats which are clamped into position (see photo) for eight minutes to assure proper set.

In the final application, the Smith-Corona monogram (made of butyrate plastic) is bonded to the acrylic key lever mask with a drop of adhesive. Here, the setting reaction is triggered by momentary finger pressure.

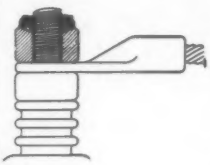
In all five applications, using an Eastman adhesive, the bonding operation, with one exception, involves only a few moments of the assembler's time. The exception is in setting the cleats to the key lever mask. •

Ten fastening problems solved by ELASTIC STOP nuts

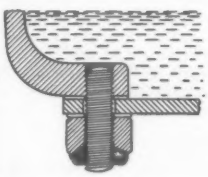
TIGHTENED AGAINST THE WORK



Vibration and impact proof bolted connections in standard applications.

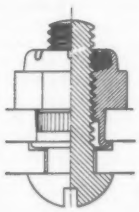


On all electrical terminals subjected to vibration in transit or operation, and for any electrical or electronic assembly where positive contact must be maintained.

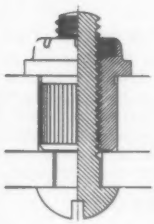


To seal bolt threads where leakage past stud threads must be prevented.

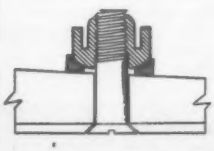
FOR MANY SPECIAL FUNCTIONS



Blind fastening applications where nut is "clinched" into sheet metal . . . becoming self-retaining as well as self-locking.

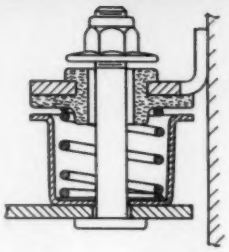


To eliminate drilling and tapping and provide steel thread strength for soft metals, an ESNA spline nut is pressed into a bored hole in casting.

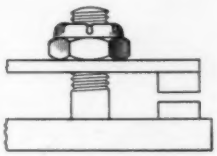


Simplified self-aligning self-locking fastener for bolting two non-parallel surfaces.

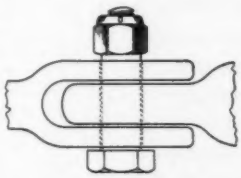
LOCKED ANYWHERE ON THE BOLT



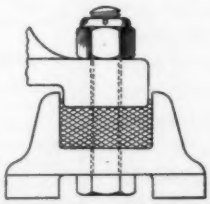
Spring-mounted connections or dynamic balancing, where nut must stay put yet be easily adjusted. (Flanged face eliminates need for extra washers.)



On make and break adjustment studs where accurate contact gaps must be maintained. Note "thin" height design for limited clearance.



For bolted connections requiring predetermined play.



For rubber-insulated and cushion mountings where the nut must not work up or down.

HOW THESE NUTS SOLVE SO MANY FASTENING PROBLEMS, ELIMINATING EXTRA PARTS AND OPERATIONS...

The red locking collar of an ELASTIC STOP® nut grips bolt threads with a perfect fit that will not loosen under severe vibration or stress reversals, and seals against liquid seepage. By bringing nut and bolt metal thread flanks into firm contact it eliminates wear producing axial play. The elastic locking action of the insert-type stop nut does not distort or gall bolt threads. It is reusable many times.

Send for the following free information: Elastic Stop nut bulletin; Rollpin® bulletin. Or enclose a drawing of your product for specific self-locking fastener recommendations. Write to Dept. N30-497.

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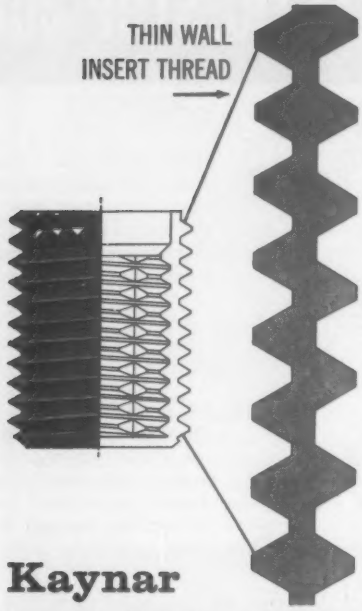
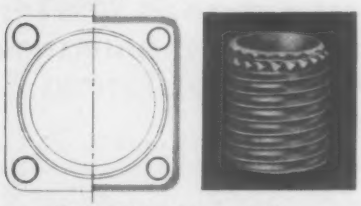
ESNA®
TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
2330 VAUXHALL ROAD, UNION, NEW JERSEY



Kaynar introduces new thin wall insert

New, high strength Kaylock® Thin Wall Insert embodies a design concept that in most cases permits one-thread size differential, I.D. to O.D. This feature makes it possible to reduce boss diameter requirements to an absolute minimum and still develop in the casting high strength potentials. The new Kaylock Thin Wall Insert can be installed in space-critical areas in minimum diameter bosses. In the installed condition it is locked positively in place, assuring fastener integrity. The internal thread-locking feature assures retention of mating bolt per MIL-N-25027. One-piece design, stainless or alloy steel, adds strength to lightweight parent materials. Easily installed — no special taps or gages. WRITE TODAY for the new Kaylock Thin Wall Insert Brochure — or contact your nearest Kaynar representative.



SAVES SPACE — all holes prepared for inserts with same internal thread size

Kaylock®
first in lightweight locknuts

KAYNAR MFG. CO., INC., KAYLOCK DIVISION
Box 2001, Terminal Annex, Los Angeles 54, Calif.
Branch offices, warehouses & representatives in Wichita, Kan.; New York, N. Y.; Atlanta, Ga.; Renton, Wash.; Montreal; Paris; London; The Hague

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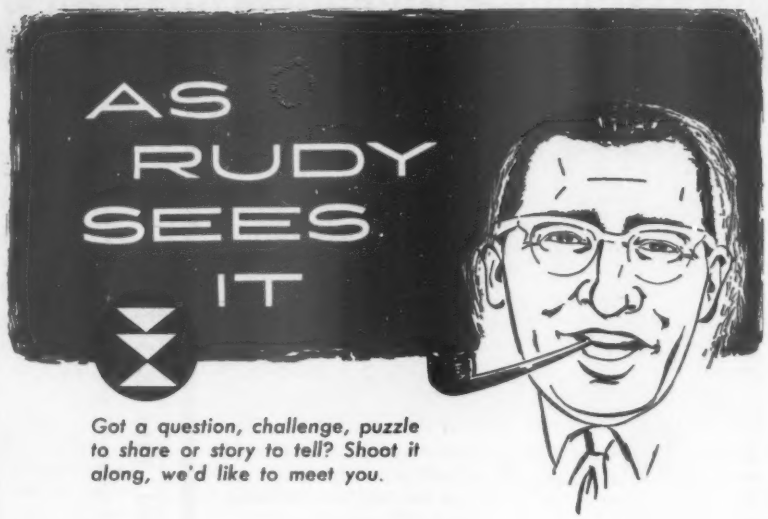


Got a question, challenge, puzzle to share or story to tell? Shoot it along, we'd like to meet you.

APPLYING FINAGLE'S LAWS

Following Dr. Finagle's four laws on experiments in last month's column, here are some suggestions on how to put them into every day practice:

Experiments must be reducible, they should all fail in the same way.

First draw your curves, then plot the readings.

In case of doubt—make it sound convincing.

Do not believe in miracles—rely on them.

Always leave room to add an explanation when it doesn't work. This open door policy is also known as the Rule of the Way Out.

Experience is directly proportional to the equipment ruined.

PLANNED OBSOLESENCE

Commenting on the need for trained automotive service technicians, a Chrysler executive stated, "A good ear was once the mechanic's most important tool. However, today the ear has been replaced by precision tools." And so modern tools have forced the ear to join the ranks of the retired, along with the "trick-wrist" torque limiter, and the "thumb and finger" micrometer.

IT'S ALL RELATIVE

Sonic booms, missile launching blasts and nuclear bombs rank low in the scale of loudness, according to a member of our staff. He claims the loudest sound of all is the first rattle heard in a brand new car.

MATH OVER LIGHTLY

Suppose a passenger rocket leaves Earth for Planet X every day at noon. At precisely the same time, a rocket leaves Planet X for Earth. Each trip lasts exactly 192 hours (8 days). How many rockets from Planet X will the Nth rocket from Earth meet? (answer on page 70).

—adapted from an ancient problem

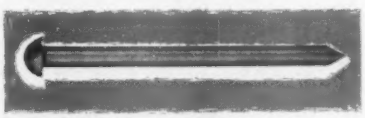
SPACE AGE INFLATION

The latest in "do it yourself" kits is the Space Age electronics kit. It guarantees to put engineers in touch with the latest materials for space age electronics. It sells for around $8000, and it makes us wonder whatever happened to the good old days of electronic experimentation when a twenty-five cent galena crystal set would do the job.

NEW PRODUCTS

The latest in a series of exciting, unusual fasteners from the design engineers of the Dumont Industrial Screw Co., is the threadless wood screw.

By eliminating the thread cutting operation, the company has been able to effect great savings in production costs. Since there are no threads, the screw may be set with any old wrench or hammer. A further savings in production costs were made by eliminating the head slotting operation. The screw, being set by impact, and not a screw driver, the designers felt a slotted head was unnecessary.



AND WE KNOW A FEW, TOO

A new type of light switch is described as being easily installed in 15 minutes and "it is not necessary to damage the wall or ceiling as would be the case if an electrician did it in the conventional manner." And what about the hazards involved with an unconventional electrician?

LIMERICK CORNER

Russ claim they invented jazz—News item—
There once was a man from Odessa,
Who claimed the Russ invented jazz, O yessa,
He stated that without a doubt,
In jazz, they were really vout,
Before a guy named Armstrong, or a Smith, called Bessa.

"[illegible] as an answer to a question as to why he [illegible] as for a service breakdown"—Food Marketing in New England.

COATED . . .

to seal out moisture

Whether you need a tapping screw that's coated to seal out moisture . . . a spinlock screw that vibration can't budge . . . a hose-clamp screw in carbon steel or stainless—call on National Lock. Utilize our design-engineering service to solve your fastener problem at lowest cost. National Lock's diverse production capacity is geared to satisfy all your standard and special-purpose screw requirements. Fasteners to your exact specifications . . . delivered when you need them . . . in the quantities you require. Write us.

NATIONAL LOCK

INDUSTRIAL HARDWARE DIVISION • NATIONAL LOCK COMPANY • ROCKFORD, ILLINOIS

INTERNATIONAL DIVISION • 13 E. 40TH ST., NEW YORK, N.Y. • CABLE: ARLAB

FASTENERS • HINGES • CATCHES • PLASTICS • LOCKS • APPLIANCE HARDWARE . . . ALL FROM 1 SOURCE

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new from

a revolutionary air power cutter

UA-100 Power Cutter—an air-operated diagonal head wire cutter with tapered heads . . . designed specifically for high-volume tip cutting and assembly where thousands of cuts per day mean increased production, reduced operator fatigue! Can be used in either hand! And it operates on existing air supplies with 90 psi line pressure. Engineered by the Utica Drop Forge & Tool Division of Kelsey-Hayes Company, the UA-100 has electronically induction hardened jaws and an insulated air cylinder formed of durable plastic. Weight only 6¼ oz. Each unit is supplied with an 8 ft. air hose. The UA-100 power cutter is another outstanding addition to the Utica line of quality tools.

UTICA DROP FORGE & TOOL DIVISION • KELSEY-HAYES COMPANY, UTICA 4, N.Y.

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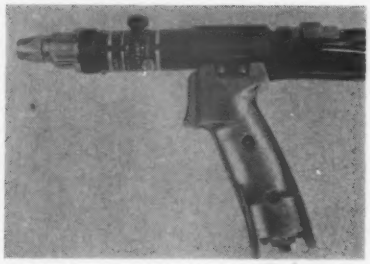
WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 62. Just circle the number on the card matching the number following the description. We'll do the rest.



See No. 1

IN-LINE DESIGN FEATURE OF MIG WELDING TORCH

A 500-ampere torch for all four types of mig welding, spray arc, short arc, plug and spot welding can be used with most mig welding machines.

Featured is an in-line design. All service lines, (gas, power, water and wire) enter the torch through the rear of the barrel.

The ST-5 has a cooling system that brings water directly into the nozzle body to cool the contact tube, permitting continuous operation at currents as high as 500 amperes, even with carbon and steel welding wire. The aluminum alloy pistol-grip handle is adjustable along the torch barrel, and is removable to permit using the torch in a mechanized installation.

Electric Welding Dept., Linde Co., Division of Union Carbide Corp., 270 Park Ave., New York 17, N.Y.

Use postpaid card. Circle No. 1

See No. 2

ADJUSTABLE STOOL FOR ASSEMBLY BENCHES

An adjustable stool made with a tubular steel base adjusts to any height from 35 to 43 inches, making it ideal for assembly bench operations.

The chair is available with a standard stool seat, saddle seat or upholstered seat and backrest.

Adjusto Equipment Co., 515 Conneaut St., Bowling Green, Ohio.

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See No. 3

DUAL RANGE POWER SUPPLY FOR PRECISION WELDING

Many similar or dissimilar metal combinations can now be welded at one assembly station with the same power supply by simply changing from one range to the other.

Model 1046 MA power supply permits operation in a low range of .0004 to 1.3 watt seconds, and a high range of .04 to 13 watt seconds.

The unit operates at a maximum repetition rate of 50 welds per minute at the maximum charge and 150 welds per minute at the minimum charge. Accurate welding of extremely fine wires, electronic circuitry junctions; ribbons and foils and microminiature joints are possible.

Weldmatic Division, Unitek, 950 Royal Oaks Drive, Monrovia, Calif.

Use postpaid card. Circle No. 3

PUNCH POINTS STANDARDIZED BY USAGE

A system of standardization for punch point sizes called Proven Usage Punch Sizes (P.U.P.S.), is based on ASTME standards.

Statistical analysis of punch usage and examination of why they are used revealed that in 8 out of 10 applications, the holes themselves are already standardized. Examples are holes for fasteners such as screws, rivets and eyelets; slip-fit rods and shafts; clearances for protruding parts and allowances for manufacturing tolerances that permit misalignment of mating parts.

The frequency with which these sizes are used emphasizes their practicality. A major appliance manufacturer reduced the number of punch point diameters from 186 to 17 P.U.P.S. to do the same job.

Dayton Perforators, Inc., 1336 Stanley Ave., Dayton 4, Ohio.

Use postpaid card. Circle No. 4

SMALL COMPRESSED AIR SYSTEMS AFTERCOOLER UNIT

Compressed air above 70° F holds moisture in suspension until it is cooled. It then parts with its entrained moisture easily.

The Murphy A4VC aftercooler is designed and built especially for the small and medium sized user.

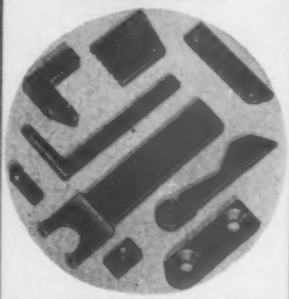
It is built for capacities of 50 to 120 cubic feet of free air per minute and features a non-corrosive copper coil through which the valve regulated cooling water flows.

The unit will cool air to within 85%

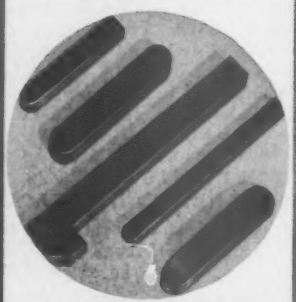
GILLEN

One Source for

KEYS AND SPECIAL PARTS



MACHINE PARTS



MACHINE KEYS

WOODRUFF KEYS

Gillen has the years of skill and experience in meeting the precise specifications of machine builders for keys and special parts of every type, size and shape.

Send prints for complete data & prices.

JOHN GILLEN COMPANY
subsidiary of
STANRAY CORPORATION
2558 South 50th Avenue
Cicero 50, Illinois

EVERY TYPE OF KEYING AND PINNING DEVICE FOR PRODUCTION ASSEMBLING · PIVOTS · BUSHES · TENSION, TAPER, GROOVE & DOWEL PINS · MACHINE KEYS & PARTS

GILLEN

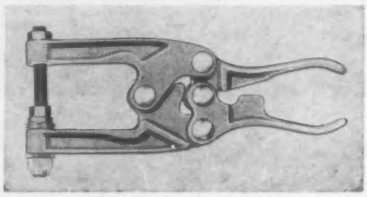
Use postpaid card. Circle No. 231

of the cooling water temperature when it is installed, operated and maintained according to instructions.

James A. Murphy & Co., Inc., 1421 E. High St., Hamilton, Ohio.

Use postpaid card. Circle No. 5

PLIER APPLIES REPEATED PRE-DETERMINED PRESSURE



A new industrial plier which permits time-after-time application of a predetermined clamping force—regardless of thickness of the work held—has a 1200 lb maximum clamping force. Heart of the Knu-Vise plier is a load-indicating washer. In use, the adjusting spindle is set for the desired clamping force by trial clamping. When the holding force is determined, the self-locking nut on the anvil is adjusted so that the load-indicating washer moves smoothly with the plier clamped on the work.

Lapeer Manufacturing Co., 1150 Baltimore W., Detroit 2, Michigan.

Use postpaid card. Circle No. 6

FULLY AUTOMATIC, HIGH PRESSURE SPOT WELD GUN

A spot welding gun with a capacity of 14,000 amps., welds from lightest gauge up to two times ⅛". It is air operated and water cooled and has fully automatic single and repeat action.

The No. 407 comes with 10" throat, however extension arms are available up to 30".

Aro Spot Welder Div., Guthery Machine and Tool Corp., 38-31 Crescent St., Long Island City 1, N.Y.

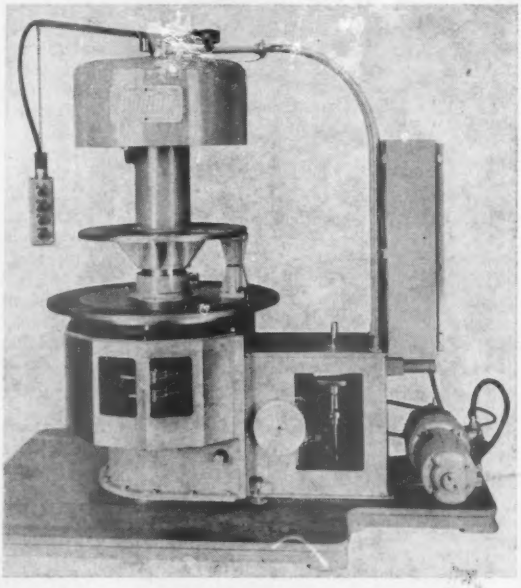
Use postpaid card. Circle No. 8

ASSEMBLY UNIT PERMITS VERSATILE TOOLING ARRANGEMENT

A new model assembly machine is added to standard line of dial type multiple operation machines. The Model 60 combines 360° of tooling availability, made possible by the center column construction.

The indexing and tooling motions are all controlled from one central cam shaft. Power pick-offs from the central cam shaft provide auxiliary cam shafts and sprockets to actuate tooling all timed directly with the main cam shaft.

The unit is intended for assembly work and has been designed around the recommendations of companies operating automatic assembly equipment.



Coining, staking, crimping and inserting operations are easily performed from the moving tooling platform without any auxiliary power source.

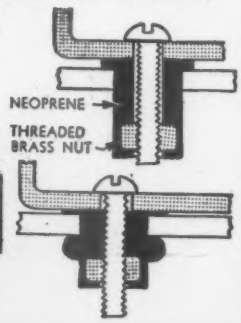
The Bodine Corporation, 317 Mountain Grove St., Bridgeport 5, Conn.

Use postpaid card. Circle No. 7

AIR-TIGHT, WATER-TIGHT BLIND FASTENER

"WELL-NUTS"* isolate vibration • space and fasten simultaneously • accept conventional threaded fasteners • will not crack or mar porcelain or glass. Send for literature and samples.

*Patented



STANDARD SIZES

CATALOG NUMBER	6S	10S	G-1032	10SL	1/4S	D-1420	Z3816
STANDARD THREAD	6-32	10-32	10-32	10-32	1/4-20	1/4-20	3/8-16
LENGTH	7/16"	33/64"	5/8"	1"	37/64"	41/64"	45/64"

ROCKWELL PRODUCTS CORPORATION
146 Central Ave., Dept. B, Newark 3, N.J., MArket 3-7650

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Hobby-Craft

TROYFORD® HOME WORKSHOP

Hobby-neering with "ROCKFORD" Screw Products

ROCKFORD, ILLINOIS

ORIGINAL DESIGN

APRIL 1951

COPYRIGHTED BY ROCKFORD SCREW PRODUCTS CO. ROCKFORD, ILL.

"ROCKFORD"

HOME WORKSHOP PROJECT of the MONTH

Hobby-neering with "ROCKFORD" Screw Products

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ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois

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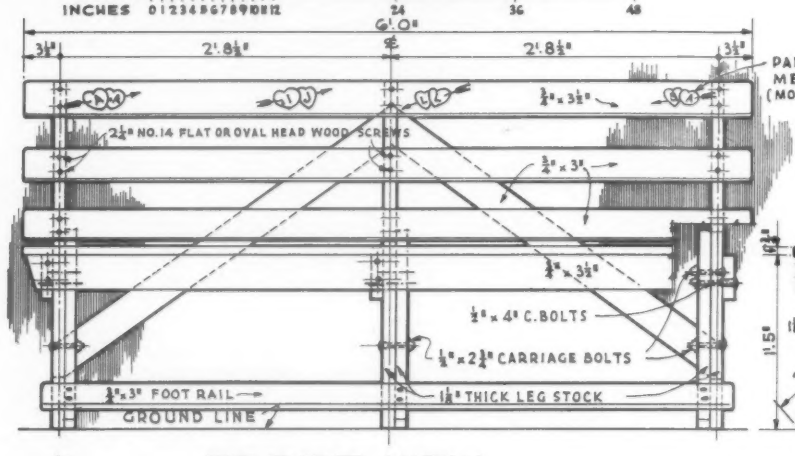
ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois

Hobby-nanza with ROCKFORD Screw Products

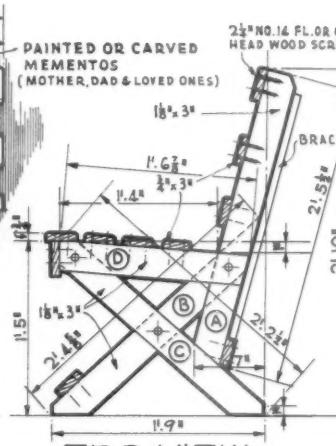
HOME WORKSHOP PROJECT of the MONTH

Lover's..Garden..Bench

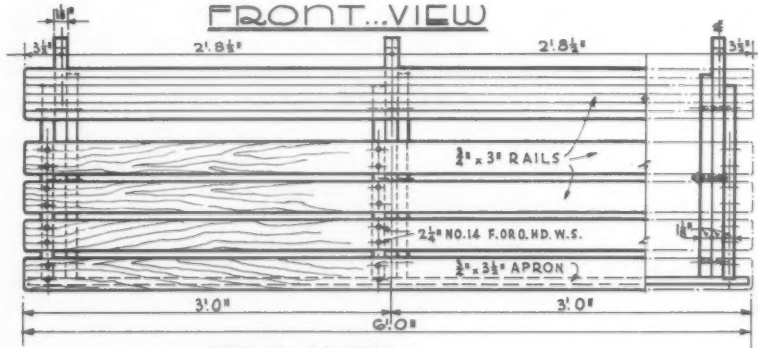
SCALE: INCHES 0 1 2 3 4 5 6 7 8 9 10 11 12 — 24 — 36 — 48



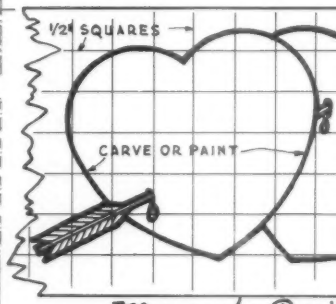
FRONT..VIEW



END..VIEW



TOP..VIEW



Memento Desi

FILL IN YOUR OWN INITIAL

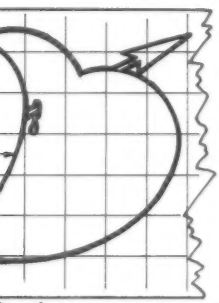
BILL..OF..MATERIAL

3 PCS.	1⅛" x 3" x 2'.5½"	Ⓐ	7 PCS.	¾" x 3" x 6'.0" RAILS	62	2¼" NO.14 OVAL OR FL.HD. WOOD SCREWS	STEEL, CAD'M OR ZINC PLATE
3 "	1⅛" x 3" x 2'.4⅝"	Ⓑ	2 "	¾" x 3½" x 6'.0" "	3	½" x 4" CARRIAGE BOLTS, NUTS & WASHERS	
3 "	1⅛" x 3" x 2'.2½"	Ⓒ	2 "	¾" x 3" x 3'.6" BRACES	6	½" x 2¾" " " " "	
3 "	1⅛" x 3" x 1'.6⅞"	Ⓓ	CYPRESS RECOMMENDED		"ROCKFORD" SCREWS & BOLTS OF COURSE		

3-29-51

INSTRUCTIONS..

- THIS PROJECT IS ONE OF THOSE OLD PERENNIAL & SENTIMENTAL FAVORITES DATING WAY BACK. WHEN. IN A SECLUDED SPOT IN THE FLOWER GARDEN MANY LOVERS YOUNG & OLD AMID THE FRAGRANCE & BEAUTY OF THE BLOSSOMS WERE INTOXICATED WITH LOVE OR PLEASANT MEMORIES OF BYGONE DAYS.
- WHEN BUILDING THE LOVERS BENCH DECORATE IT WITH MEMENTOS THAT ARE DEAR TO YOUR HEART. CARVE THEM OR PAINT THEM ON THE TOP RAIL AS SYMBOLS OF LOVE & DEVOTION.
- USE CYPRESS IN THE CONSTRUCTION OF THE BENCH FOR PERMANENCE. PINE OR REDWOOD MAY BE USED IF CYPRESS IS NOT OBTAINABLE.
- OF COURSE THOSE FINE "ROCKFORD" SCREWS & BOLTS WILL MAKE STURDY ASSEMBLIES IN EITHER CASE. BE SURE TO ASK FOR THEM.



esign...
ITIALS IN HEARTS

A NEW SERIES NO. 11 WILL FOLLOW AND WILL CONSIST OF 12 INTERESTINGLY DIFFERENT MONTHLY PROJECTS

- YOUR NICE LETTERS & COMMENTS HAVE MADE THE CONTINUING OF "HOBBY-NEERING" POSSIBLE. *SO TO ALL OF YOU WHO HAVE WRITTEN TO ME THANK YOU VERY MUCH.* Herm.

Hobby-neering

SERIES NO. 11

PROJECT 1	Designed by E. Hager OF ROCKFORD
USE FOR COMMERCIAL PURPOSES IS FORBIDDEN	

★ HERE THERE AND EVERYWHERE with "ROCKFORD" Screws and Bolts ★

"THE CHIEF" with 6126 Rotary Attachment

ATTACHABLE IMPLEMENTS AVAILABLE MOLD-BOARD PLOW, DISC HARROW, SPIKE TOOTH HARROW, CULTIVATOR, SEEDER & FERTILIZER, SNOW-PLOW BULL DOZER AND 3 OR 5 GANG REELS.

Manufactured by:
JACOBSEN MANUFACTURING COMPANY
RACINE, WISCONSIN

Allis-Chalmers' VARI-TEX Speed Changer employes the use of a belt transmission whose pulley diameters can be changed by varying the pitch of a companion set of sheaves. The VARI-TEX Speed Changer (in both horizontal and vertical designs) includes ratings up to 30 HP and speeds to 3600 RPM. It can be used on conveyors or other material handling operations, machine tools, mixing machines, or other operations where closely controled speed is required.

"VARI-TEX" SPEED CHANGER

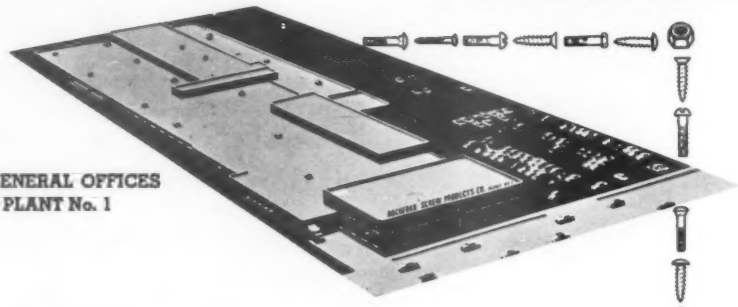
Shown is an Allis-Chalmers' RCF pump, ranging in size from 1¼" to 3" with a maximum output of 350 gal. per minute with heads to 90 ft. It is ideal for handling liquids containing grity or abrasive material. A typical application for the RCF pump is in the machine tool industry for circulating coolant to the cutting areas of lathes, drills, and honing machines.

Manufactured by:
ALLIS-CHALMERS
MANUFACTURING COMPANY
NORWOOD 12, OHIO

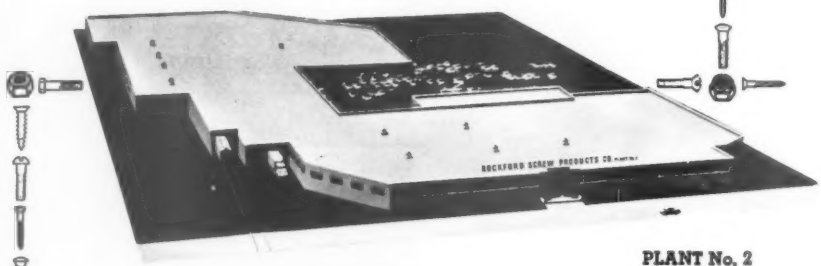
RCF PUMP

TELEPHONE
WOodland
4-9441
TELETYPE
R.K. 7603

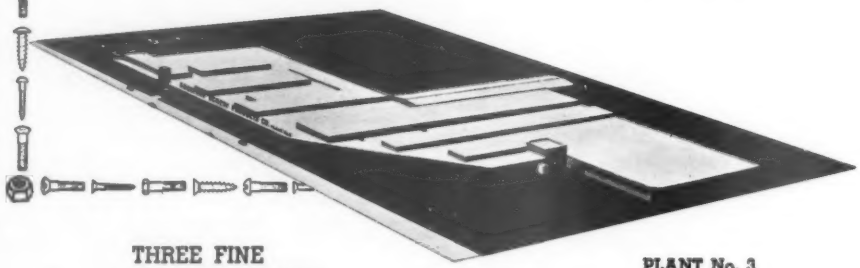
"ROCKFORD"®
Screw Products Co.
2501 NINTH STREET - ROCKFORD, ILL.



GENERAL OFFICES
& PLANT No. 1



PLANT No. 2



PLANT No. 3

THREE FINE
MODERN PLANTS
PRODUCING "*ROCKFORD*" QUALITY CONTROLLED
THREADED FASTENERS FOR AMERICAN INDUSTRIES.

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ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois

"ROCKFORD"®
HOME WORKSHOP
PROJECT of the
MONTH

ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois
ROCKFORD
PROJECT of the MONTH

TORQMATIC

By ARO

Versatile Screwdrivers and Nutsetters with

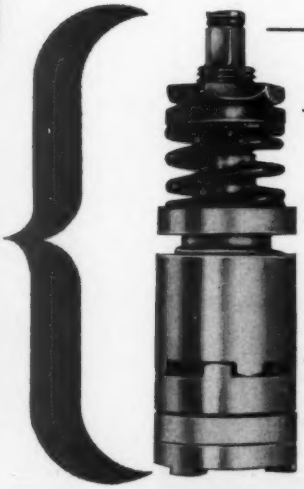
Single Action Clutch

This new Torqmatic is no ordinary clutch. It delivers uniform torque action through any number of cycles. Torque is preset and operator cannot overrun the threaded fastener. What's more, action is *positive*. Clutch disengages instantly when torque limit is reached . . . and remains disengaged until pressure on the work is released. There is no noisy ratcheting. And there is no impacting action. This means you can use Aro Torqmatic on highly delicate work.

As for reliability, consider this: Aro Torqmatic features new, simplified design with fewer working parts. You can't beat it for high-production performance on your toughest screwdriving and nutsetting jobs.

Job test Aro Torqmatic, and experience for yourself its superior performance capabilities. Just ask your Aro Distributor.

Fully Interchangeable With The Clutch In Any ARO "0" Series Or "000" Series C-Model Tools . . .
NO ADAPTORS OR SPECIAL TOOLS NEEDED!



- **Easy to Adjust — Maintains Settings Indefinitely**
- **Positive Torque Adjustment**
- **Smooth Ball Bearing Action**
- **Constant Dynamic Balance**
- **Declutches Without Kicking**
- **Front End Support**

ARO

THE ARO EQUIPMENT CORPORATION
Industrial Division • Bryan, Ohio
Aro of California, 3141 S. Grand Ave., Los Angeles 7
Aro Equipment of Canada Ltd., Rexdale (Toronto), Ont.
Offices in Principal Cities

AIR TOOLS
Air Hoists-Automation Tools
Ultrasonic Controls

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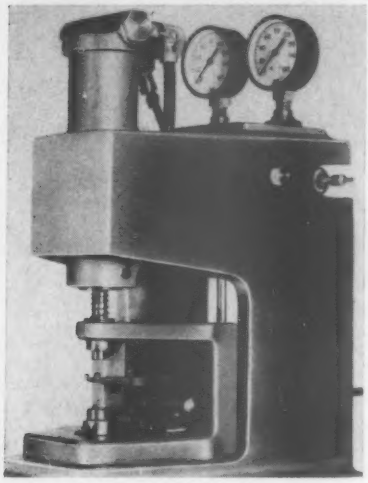
AUTOMATIC HEAVY DUTY MACHINE PRESSES, STAKES



Press-stake-eject cycle is combined in one high-speed, fully automatic assembly tool. Independent pressing and staking forces adjust from lightest tap to one ton, while automatic adjustable ejector removes finished assemblies.

Standard interchangeable tooling fits removable C-holder die set which adapts to a wide variety of assembly operations. The lower part of the machine fits into a work bench for ideal working height.

Compressed air power and precision machining assure fast production from primary components.

Cramer Controls Corp., Machine Tool Division, Miller St., Centerbrook, Conn.

Use postpaid card. Circle No. 9

MACHINE TOOL ASSEMBLY RIVETER HEAD AVAILABLE

Spin-impact, peining type riveter head, available as a separate unit, can be easily mounted on a column, pedestal, or panel. It also can be made part of a special-purpose machine tool assembly. Several heads, if desired, can be combined on one machine in various arrangements and operated separately or simultaneously.

A small motor rotates the air-operated piston, resulting in rapid succession of peining blows by the rotating tool. Air regulator, solenoid valve and synchronous timer control, offered as optional accessories, will provide adjustable impact and controlled pein cycle.

Hill Machine Co., 1303 Eddy Ave., Rockford, Ill.

Use postpaid card. Circle No. 10

WELDER EQUIPMENT FOR ELECTRONIC CIRCUITRY

Stored-energy welding equipment designed for manufacturers of precision electronic components includes six different stored energy power supplies and five different weld heads and handpieces.

Sizes and ratings are designed to enable selection of a setup to meet any of the needs of manufacturers of relays, tubes, transducers, pots, thermocouples and high density component packages.

The Hughes welding power supplies include ultra short discharge time, fully metered controls, input voltage regulation and are made so that they can be used on standard production benches without need for special installations.

Vacuum Tube Products Div., Hughes Aircraft Co., 2020 Short St., Oceanside, California.

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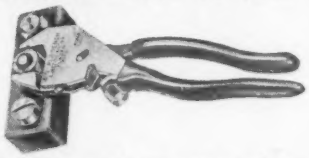
POSITIVE LOCKING SCREW CONVERTS PLIER TO VISE



Featuring a 10:1 geared ratio between jaw and handle, Plierench has a positive locking screw which converts the tool into a portable vise. It has a one ton gripping power.

Five interchangeable jaws are provided with the tool, and custom jaws are available for riveting, crimping and special assembly work.

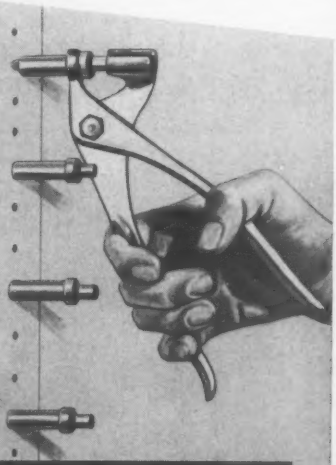
Plierench Company of America, 4611 N. Ravenswood Ave., Chicago 40, Ill.

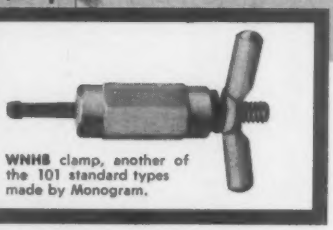
Use postpaid card. Circle No. 12

HOLD IT!

...better, faster, at lowest cost with Monogram Kleko Clamps

Stop wasting time and money with less efficient temporary fasteners and start solving all your sheet metal holding problems using MONOGRAM Kleko clamps and affixing tools. Write, wire, phone now for information on our 101 precision-engineered standard clamps for practically every temporary holding need during fabrication. *And,* if we don't carry the clamp you call for, we can make it faster, better to highest specifications.





WNHB clamp, another of the 101 standard types made by Monogram.

MONOGRAM Precision Industries, Inc.
8557 Higuera Street, Culver City, Calif., UP 0-6531

Use postpaid card. Circle No. 234

Torque Wrench Adapter

Calculator Slide Rule

Free

Instantly calculates scale conversion factors for adapters of different lever lengths—set it and read it.

Provides automatic selection of proper torque wrench for adapters and/or proper adapters to go with given torque wrenches.

Sent free upon request, compliments of

PA STURTEVANT CO
ADDISON QUALITY ILLINOIS

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Use postpaid card. Circle No. 236 →

Type 316

Type 316

story of two bolts...

Both of the bolts shown above were used on the *same* application, in the *same* factory, and faced the *same conditions*.

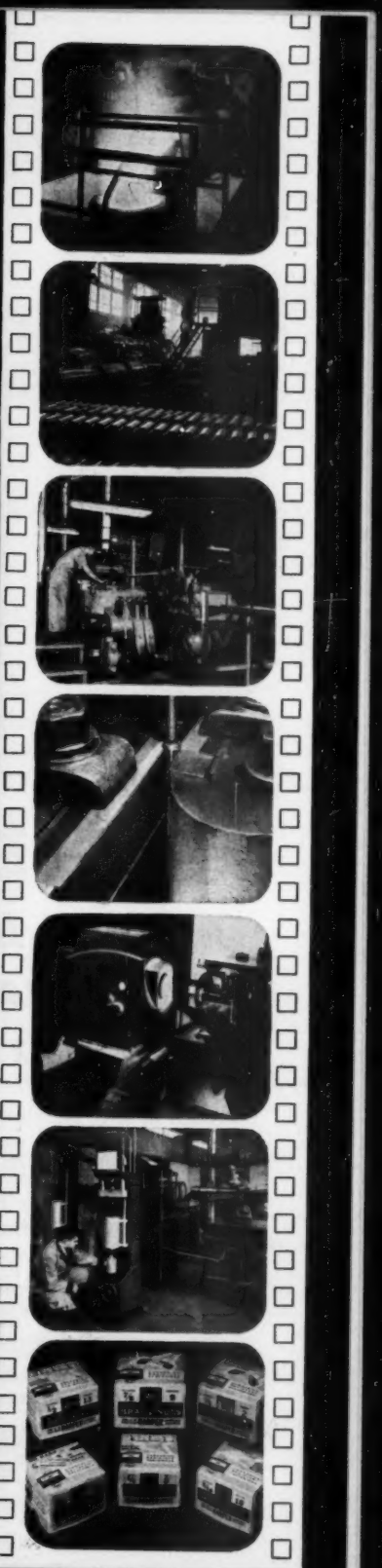
The bolt on the left is a Harper type 316 Stainless Steel bolt shown after three years of service. The bolt on the right is another manufacturer's bolt, identified as type 316 Stainless Steel, shown after only three months of service.

The dramatic fact that the Harper bolt lasted twelve times longer (and is still in service) is proof of Harpers' metallurgical control of alloys from "billet to bolt" in our completely integrated factory. Harper's corrosion-resistant fastenings, immediately available in a wide range of alloys and sizes, assure you that *your* products will be built to last no matter what the application may be.

Harper Distributors everywhere maintain complete stocks. Consult your Yellow Pages.

Write today for free copy of Harper's new "Strength" booklet —a factual treatise on important fastening metallurgy.

shaping metals that shape your future.



THE H. M. HARPER COMPANY
8200 Lehigh Avenue · Morton Grove, Illinois

HARPER

SWENCH®

Manual Impact Wrenches

NOW AVAILABLE IN NEW ½" & ⅝" UTILITY SIZES

Small in size, the all new ½" and ⅝" SWENCH manual impact wrenches are big in power when it comes to loosening tough, small "frozen" nuts and bolts.

Like the heavy duty SWENCH wrenches for industrial use, the new ½" and ⅝" sizes apply a tremendous wallop of torsional impact in automotive, light industrial, commercial, and utility use.

Now a completely portable SWENCH can be taken to any job — big or small — for high speed, safe and easy removal of "frozen" nuts and bolts that previously had to be burned off or drilled out. SWENCH wrenches are economical too — they cost far less than other types of impact wrenches and save valuable man hours.

In addition to the new ½" and ⅝" sizes, SWENCH wrenches are available with ¾", 1", 1¼" and 1½" drives. Call your local industrial distributor today for a demonstration or write to:

Don't wrench it - SWENCH IT!

CURTISS WRIGHT
MARQUETTE DIVISION
1145 Galewood Drive, Cleveland 10, Ohio

AD NO 30-6

Use postpaid card. Circle No. 237

LOCATION GAGE EXTENSIONS INCREASE RANGE TO 11"

A set of four extensions is designed to increase the range of a location gage.

The gage is used to measure the distance from the outer wall of a beveled or rectangular groove to a plane of reference 0.4" to 1.4" from the groove wall. With the extensions, the range may be increased from 1" to 11".

The extensions, made of hardened tool steel, are 1" to 4" in length. They may be used individually or in combinations of varying length.

Knurled ends facilitate attaching and removing the extensions from the gage.

Truarc Retaining Rings Division, Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.

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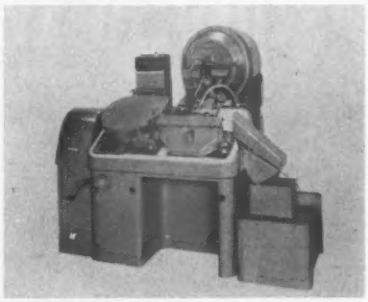
FLAT DIE THREAD ROLLER HAS HIGH PRODUCTION RATE



A thread rolling machine with a capacity up to 400 pieces per minute uses standard flat dies and features simplified design for ease of set up and maintenance.

Thread lengths from ⅛" to 1½"; are possible with the standard dies. Special dies increase the length to 3". Screw capacity is from No. 2 to No. 10 on the automatic model, and from No. 0 to No. 10 on the manual model.

Roy Machinery & Sales, New Britain Ave., Farmington, Conn.

Use postpaid card. Circle No. 14

LIGHTWEIGHT SOLDER GUN HAS FAST WARM UP

A lightweight soldering gun is available that is ready-to-use in two and a half seconds. It is ideal for use by radio and laboratory technicians.

Equipped with a thermo plastic handle, the high-impact, flame resistant

gun is a transformer type model using 1.3 amperes, 115 vac. A prefocused spotlight is built into the housing for adequate illumination of the working area.

Portable Electric Tools, 1200 E. State St., Geneva, Ill.

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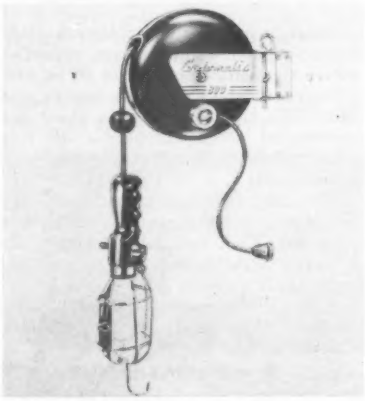
ELECTRIC CORD REEL RETRACTS AUTOMATICALLY



Reel eliminates dangerously kinked and knotted electric cords. The cord automatically retracts into its reel housing when not in use.

The Cordomatic droplight reel, model 800, offers several exclusive features; the locking mechanism has a positive gravity stop action, which locks and releases with finger-tip control at any length up to 30'. It also has a dust-proof, heavy-duty spring motor. The complete unit is UL approved.

Cordomatic, 17th and Indiana Ave., Philadelphia 32, Pa.

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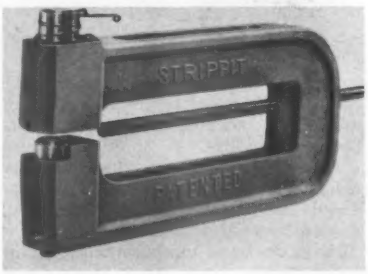
UNIT PUNCHES HOLES WITHOUT GUIDE BUTTONS



Only a punch and die are required to punch both round and shaped holes with the "BN" hole punching unit. It is designed for use with or without guide buttons.

All holders are keyed and are supplied with self-storing keys. The design of the die section permits easy removal and rotation of the die without removing the holder from the set-up.

In addition, holders permit punching closer to the leg of formed flanges and angles.

Wales Strippit Inc., 241 S. Buell Rd., Akron, N.Y.

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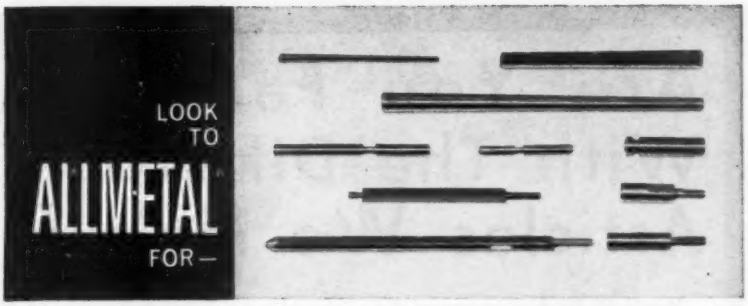

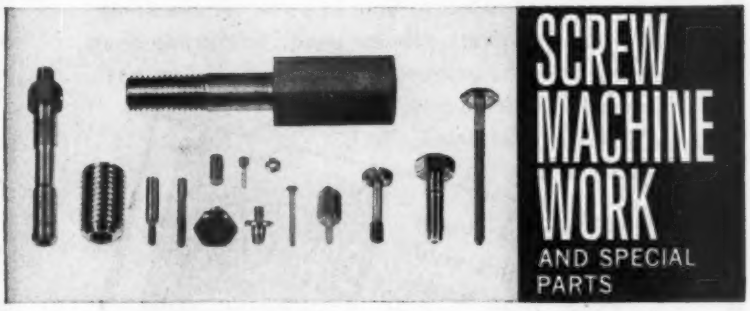

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• HOT FORGING EQUIPMENT • LARGE MODERN PLANT

For standard stainless steel fasteners, you can depend on Allmetal to provide immediate shipment from "the world's largest stock of stainless fasteners."

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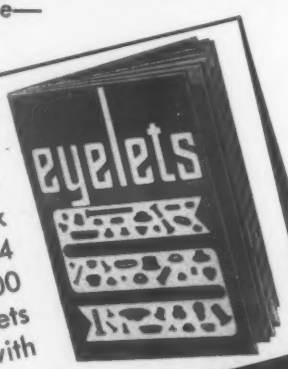
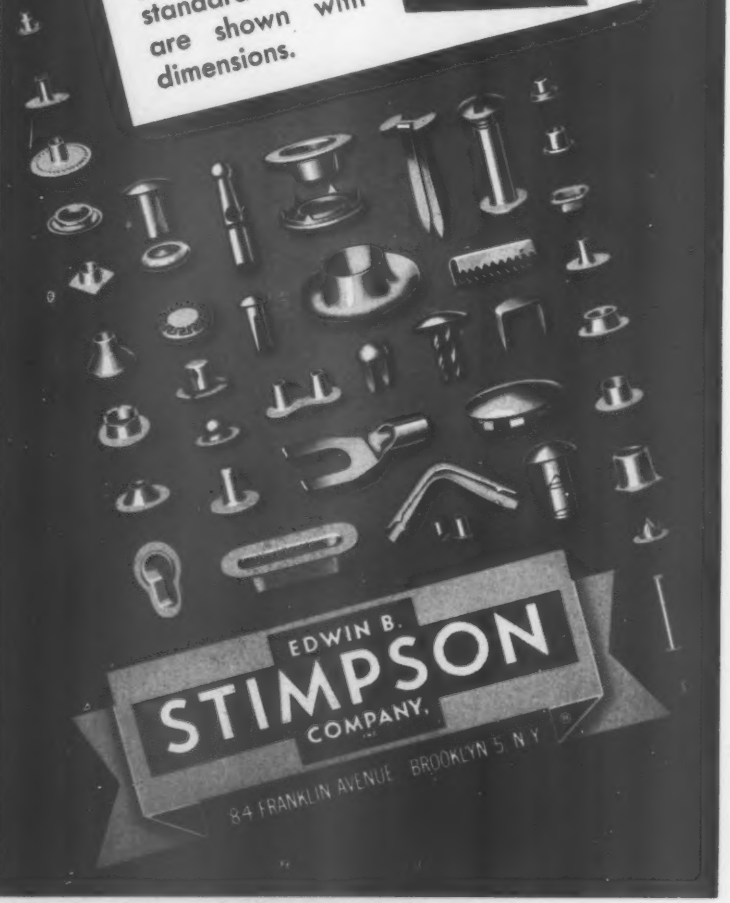
Are You Familiar With The Different Articles We Make?

You will find us prepared to supply a type of fastener that is exactly suited to your specific requirements. If you use split rivets, tubular rivets, side-prong rivets, eyelets, washers, grommets, snap fasteners, or any other similar metal article—write for samples and prices—today.

Send for your copy of this valuable free book. Actual size 8½ x 11—contains 104 pages—over 2000 standard eyelets are shown with dimensions.





EDWIN B. STIMPSON COMPANY
84 FRANKLIN AVENUE BROOKLYN 5 N.Y.

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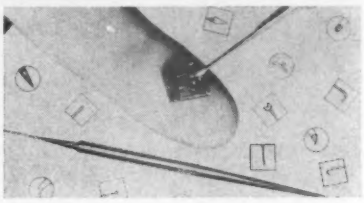
HAND TOOLS DESIGNED FOR MICROMINIATURE CIRCUITS



Hand tools for microminiature electronics and instrument use embodies active elements from .001 to .01 in size.

Keyed to solid state electronics, the Microtools are engineered for electronic instrument work compatible in size with advanced microcircuitry and components.

All sixty-seven different tools are completely interchangeable in handles provided. Each tool is designed to do a specific microelectronic or instrument job.

Circon Component Corp., Santa Barbara Municipal Airport, Goleta, California.

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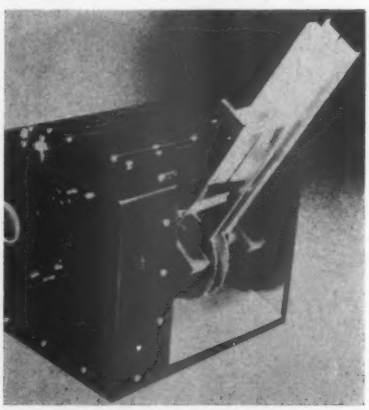
MACHINE CUTS, FORMS AXIAL LEAD COMPONENTS



A machine interchangeably cuts, forms, or cuts and forms lead wires of axial lead components used in electronic assemblies.

A unit with a wide range of adjustment, it requires no tools, additional die sets, or extra parts for its operation. Average set up time is 30 seconds.

Fully electrical in operation, the unit automatically processes components ranging in size from miniature glass diodes to large axial lead capacitors.

Model H101 is equipped to give a right-angle bend to component leads. Special bending dies can be added to produce other configurations.

Heller Industries, Inc., 70 S. Munn Ave., East Orange, N.J.

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UTILITY VISES DESIGNED FOR RUGGED USE

A line of utility vises is designed specifically for rugged use.

The 640 line consists of two sizes,

No. 643½ and 645. The 643½ has a jaw width of 3½", a maximum opening of 4" and a jaw depth of 3". The pipe capacity ranges from ⅛" to 2".

The 645 has a jaw width of 5", a maximum opening of 5½" and a jaw depth of 3¾". The pipe capacity is ⅛" to 2½".

The pipe jaws are replaceable and are made of hardened steel. The top jaws are also replaceable and are made of serrated steel.

Wilton Tool Mfg. Co., Inc., 9525 Irving Park Blvd., Schiller Park, Ill.

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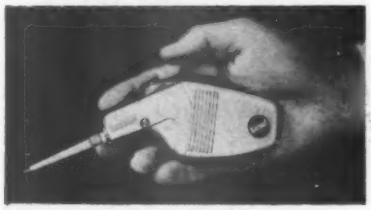
SOLDER DISPENSING TOOL HOLDS 8-HOUR SUPPLY



Specially designed for the eight-hour-a-day assembly line solder technician, the aluminum die-cast solder dispensing tool weighs 5½ ounces fully loaded.

The lightweight Kormat soldering tool has a Teflon dispersion coating applied to the inner surface to reduce friction to a minimum.

Soldering with the tool eliminates hand oil and acid contaminants from coming into contact with the solder and becoming alloyed into connections.

Probe tips in a variety of sizes and curvatures are available as accessories.

Commercial Products Div., International Electronic Research Corp., 135 W. Magnolia Blvd., Burbank, Calif.

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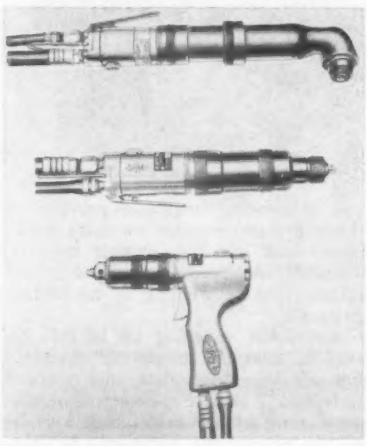
INTERCHANGEABLE PARTS IN AIR DRIVEN ASSEMBLY TOOLS



Handles, motors, gear cases (rpm) and clutches are interchangeable in line of air powered drills, screwdrivers, and nut runners.

Many different combinations are

If you're looking for fasteners for that special application . . . fasteners that provide you with maximum reliability because they're precision-engineered, produced to strict tolerances and thoroughly tested . . . it will pay you to check with Chandler first! Here's why . . . Chandler has specialized for over thirty years in producing high quality special fasteners . . . as well as standard cap screws and bolts to meet rigid aircraft, military and industrial standards. Design features of these cold-headed fasteners include special heads, shanks or threads . . . drilled, rolled, ground, plated or coated . . . plus controlled atmosphere heat treating . . . to comply with your requirements.

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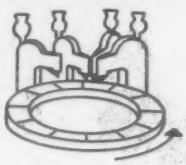
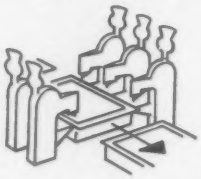
A FEW OF MANY POSSIBLE RIVETING HEAD POSITIONS THAT CAN BE USED

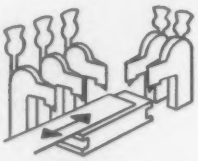


Rotating fixture showing suggested arrangement of riveting heads.

Riveting heads can be positioned for fastening on flat or curved assemblies.



Conveyor Belt permits multiple setting on both sides of an assembly.



Sliding fixture used for riveting 2 sides of an assembly.

AUTOMATE RIVET SETTING

for new low costs

For years assemblies made of metal and non-metal or a combination of both have been fastened most economically with semi-tubular rivets. And now even lower costs are possible with the thin-nose riveting heads designed by Chicago Rivet. These heads, pneumatically operated but electronically controlled, can be grouped in clusters on one or more planes and will set rivets as close as 13/16" apart. Automation, thru rotating sliding or continuous belt feeding and riveting stations, is possible. Riveting heads may be repositioned and used again on new assemblies.

CUSHIONED RIVETING REDUCES BREAKAGE

A pneumatic riveter upsets the rivet with a squeezing action which minimizes breakage and automatically compensates for slight variation in assembly thicknesses.

The suggestions of Chicago Rivet fastening specialists will prove most helpful. Call them—no obligation.

AIR-POWERED RIVETING CATALOG contains description and specifications of 8 single and multiple riveters—also rivet setters designed for automation.

RIVET CATALOG describes 1388 standard tubular and split rivets and 25 single and multiple motorized automatic rivet setters.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb) • Branch Factory: Tyrone, Pa.

Use postpaid card. Circle No. 241

possible to assure a properly fitted tool for the intended job. Any of the sub-assemblies can be quickly changed to convert a tool to a different use.

Air and oil exhausts from the base of the handle through a remote exhaust hose or deflecting silencer so that it cannot be blown on the work. Motors have a built-in speed control and a built-in reservoir for oil, when a line oiler is not used. The reservoir will hold enough oil, and automatically dispense it, for one day's operation.

Albertson & Company, Inc., 3101 Lowell Ave., Sioux City 2, Ia.

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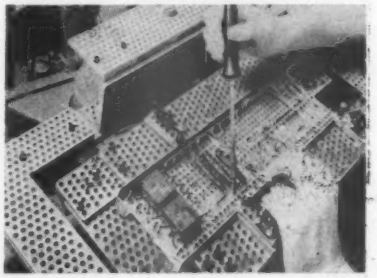
MIDGET SOLDERING IRONS REACH INTO CLOSE AREAS



The soldering of joints separated by less than 1/8" is possible with midget soldering iron.

Standard interchangeable tips increase the versatility of the irons, making them ideal for precision electronic circuit soldering.

General Electric Co., Schenectady 5, New York.

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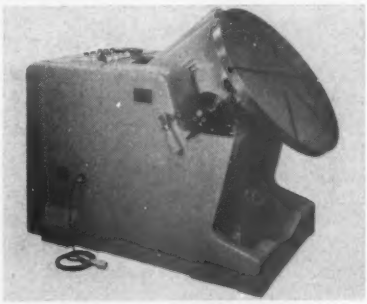
TURNTABLE POSITIONER HOLDS ONE TON ASSEMBLIES



A positioning machine provides a motor driven turntable on which weldments and other assemblies may be mounted for precise positioning and rotation during welding or fabrication processes.

Assemblies weighing up to 2000 lbs may be mounted on the 32" diameter flat machined faceplate and secured to milled T slots. Pre-selected angular positioning of the table from vertical to 15° beyond the horizontal is automatically achieved by adjustment of the control protractor and energizing the drive motor.

A control knob on the PM 1051 positioner permits selection of rotation

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speed from 0 to 4 rpm, while a meter, calibrated in rpm, provides visual indication of actual speed.

Boesch Mfg. Co., 45 River St., Danbury, Conn.

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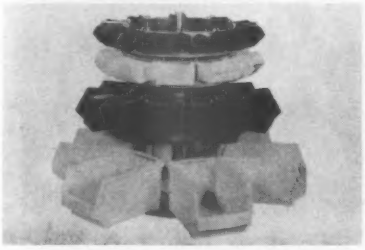
ROTARY BENCH STANDS AID ASSEMBLY OPERATION



Rotary bench stands for plastic containers keep parts and fittings at the worker's fingertips during assembly operations. The unit is easy turning, but stays where it is placed for efficient work.

The stands are furnished to mount various combinations of the three Plastibox sizes or for mounting all of one size. The boxes are easily removed for refilling.

G. B. Lewis Co., Dept. PRB, 426 Montgomery St., Watertown, Wis.

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TAP HOLDERS WITH ADJUSTABLE DEPTH CONTROL

Tap holders may be used as either releasing or non-releasing holders on all machines with reversing spindles. Smooth in operation, they convert any machine on which they are used into a precision tapping machine.

The length of pull out for releasing can be varied from a minimum of 1/16" to a maximum of ¾" by a simple adjustment of the knurled depth control collar.

The Tapmatic tap holders are available in tap capacities of 5/8" diameter from No. 0 to No. 12; 1" diameter from No. 0 to ½"; 1¼" diameter from No. 10 to 5/8".

Tapmatic Corporation, 845 W. 16th St., Costa Mesa, Calif.

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If we don't stock the plier-type tool you need

we'll make it for you

Using an exclusive cost-saving system of matched components, Sargent will design and build the plier-type tool you need for production, product installation, or maintenance. Sargent "Specials" cut, crimp, hold, shape, or perform a dozen other operations.

And Sargent is an experienced hand at making both "special" and standard hand tools. Variations of our compound action or standard action pliers are used by major companies all over the country. Available completed or with blank jaws and frames, you'll find the Sargent system is the answer to the purchase of quality special purpose hand tools in both large or small quantities at economical prices.

For additional facts send for Sargent's Hand Tool Catalog and Case History book. Write: Sargent & Company, Hand Tool Division, New Haven 9, Connecticut

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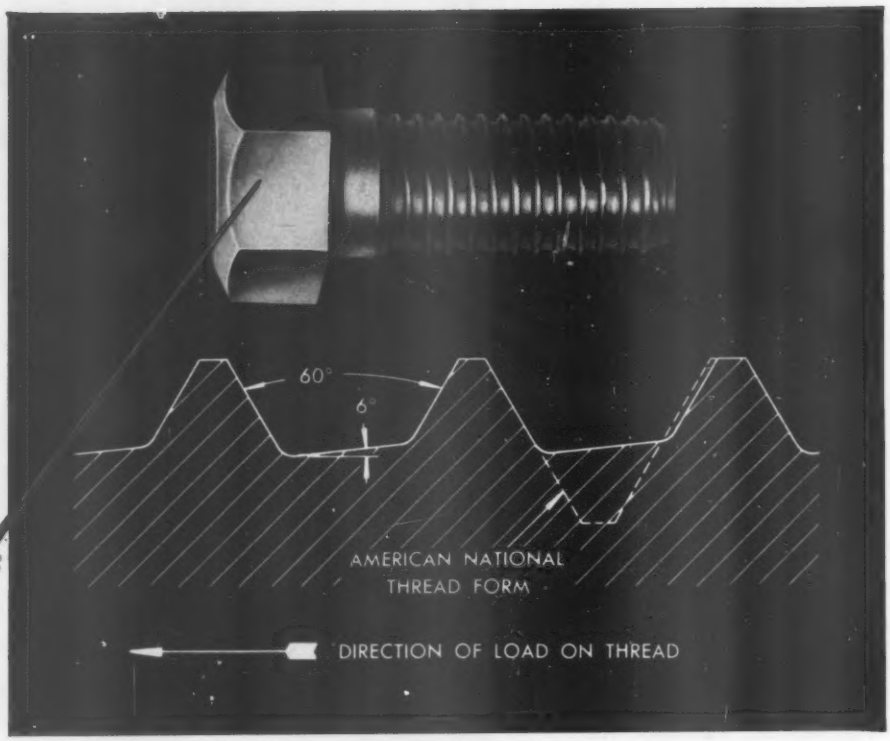
NAT'S quick facts about Fasteners...



Can **any** fastener actually **become tighter** in service?

WELL, HARDLY. NOT JUST *ANY* FASTENER...

But self-locking, extra-strength LOK-THRED® bolts, studs and screws *do*, and even after long service you can expect their breakaway removal torque to average about 70% higher than at installation.

Here's the reason. Just take a look at the LOK-THRED profile. Notice the extra-wide root? And its converging angle? It's held, strictly by design, to exactly 6 degrees.

Now, see what happens, as you drive any LOK-THRED fastener. It re-forms the metal of the receiving thread, squeezing out every void, and forming an intimate metal-to-metal contact. And each of the angled roots becomes a 6-degree tapered wedge, with the loading constantly pulling against it to make its anchorage even firmer.

That's why LOK-THRED fasteners actually *do* become tighter in service. They're self-sealing, too . . . fluids can't leak past them. And yet they're fully reusable . . . require no selective fits . . . can be used with ordinary tools.

Take our word for it, there are plenty of reasons* why LOK-THRED is superior for many kinds of fastening . . . and we'll be glad to help you develop any applications to your own products.

*They're all given in National's LOK-THRED booklet, with plenty of supporting data. Write for your copy.

National PRODUCTS

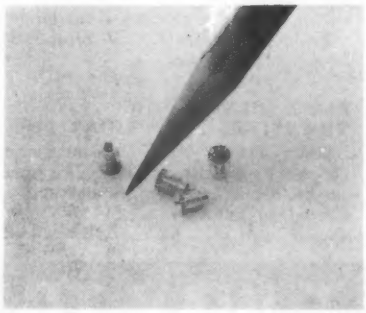
The National Screw & Mfg. Company • Cleveland 4, Ohio

California Division, The National Screw & Mfg. Company • 3423 South Garfield Avenue, Los Angeles 22, California

Use postpaid card. Circle No. 243

WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners or methods use the handy postpaid card opposite page 62.



See No. 30

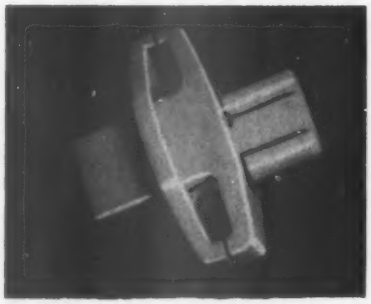
ONE PIECE MINIATURE INSERT EASILY INSTALLED

Designed for use in areas of reduced edge distance, the Minisert requires one simple tool for installation or replacement. Combining all the desirable features of miniaturization in a one piece insert, it is available in sizes from 0-80 to 4-40, and in a variety of materials.

Optional thread locking features are also available.

Components Engineering and Mfg. Co., 5468 Valley Blvd., Los Angeles 32, California.

Use postpaid card. Circle No. 30



See No. 31

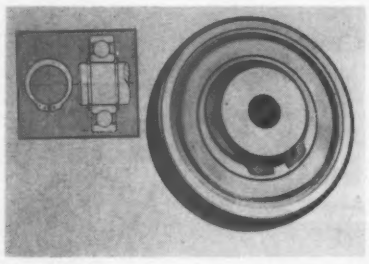
LIGHT CLAMPING DURING ASSEMBLY

Temporary clamping of harness assemblies, printed circuits, or assemblies where light clamping is needed is easily accomplished with spring-action double ended clips.

Made of a strong, lightweight plastic, the clips open at either end with a squeeze of the fingers. They are 2" in length.

Edmund Scientific Co., Barring, N.J.

Use postpaid card. Circle No. 31



See No. 32

HEAVY DUTY RETAINING RING FOR ASSEMBLIES

A heavy-duty, external type retaining ring designed for assemblies subjected to extreme loading conditions has high thrust load and impact resistance. It also provides a shoulder sufficiently high to retain parts having large corner radii or chamfers.

The series 5160 is especially suitable for retaining bearings. It may be used without spacer washers to secure ball bearings, tapered roller bearings and cylindrical roller bearings.

The heavy-duty ring is available in 11 sizes designed for shafts ranging in diameter from .473" to 2.0". Standard material is carbon spring steel (SAE 1065-1090); standard finish is oil dip.

Waldes-Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.

Use postpaid card. Circle No. 32

DRY FILM LUBRICANT RESISTS SEIZING, GALLING

A permanent, solid dry-film, resin bonded lubricant contains a modified molybdenum disulfide compound. It is bonded by a special process to the surfaces of metal components, and provides a thin solid film which maintains its dry lubrication properties throughout the normal life of the components.

Surf-Kote is designed to eliminate galling, seizing, fretting corrosion, cold welding, and similar troubles encountered with moving parts subjected to pressure and temperature. At normal temperatures it is resistant to oxidation.

Stratos Division, Fairchild Engine and Airplane Corp., Bay Short, L.I., New York.

Use postpaid card. Circle No. 33

SOCKET JAM SCREW HAS CLEAR-THROUGH HEX SOCKET

Added to line of precision socket screw products and dowel pins are socket jam screws. The feature of the screw is the clear-through hexagon socket. It is accessible from either end permitting fast, easy assembly.

Holo-Krome socket jam screws are designed to fill a need for the shortest practical compression fastener with maximum thread engagement, allowing maximum torsional load.

Holo-Krome Screw Corp., Brook St., Hartford 10, Conn.

Use postpaid card. Circle No. 34

LOW TEMPERATURE SILVER BRAZING ALLOY

Developing 50,000 psi tensile bonds with 25% elongation and 1260° F working temperature, low cost, low heat

"MATCHED" NUTDRIVER SET

hollow shaft . . . color coded
. . . every tool in its place

- 7 popular sizes 1/4" thru 1/2"
- hollow shafts for extra clearance
- precision fit, case-hardened sockets
- high carbon steel: chrome or nickel plated
- color coded, shockproof plastic handles (UL)
- heavy gauge, non-tip stand with handle wells
- large, readable, size indexes

No. 147 bench set

OTHER SETS, TOO: solid-shaft, hollow-shaft, or mixed . . . bench and wall rack models

PLUS FULL RANGE OF SEPARATE NUTDRIVERS: 3/32" thru 3/4" - regular, stubby, extra-long, midget (pocket clip)

available through leading electronic and industrial distributors

XCELITE, INC. • ORCHARD PARK, N. Y.
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

XCELITE®
HAND TOOLS
QUALITY SCREWDRIVERS, NUTDRIVERS, PLIERS, WRENCHES, SERVICE KITS, and SPECIAL PURPOSE TOOLS

Use postpaid card. Circle No. 244

phosphor-copper silver brazing alloy is recommended for joining all copper alloys.

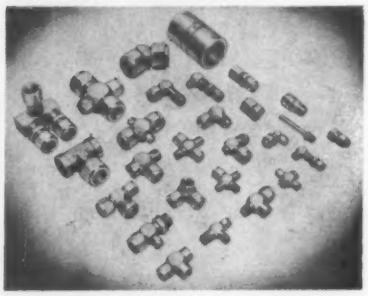
Bright Finish No. 23 alloy is engineered to replace more expensive high-analysis silver brazing alloys yet maintains comparative strength, elongation and high corrosion resistance. The brazing alloy can be applied by all standard brazing methods.

Available in 1/16" to 1/4" x 18" rods and .050 x 1/8" strip, the alloy is packaged in one, ten and fifteen-pound packages.

All-State Welding Alloys Co., 249 Ferris Ave., White Plains, N.Y.

Use postpaid card. Circle No. 35

EXPANDED SERVICE IN SPECIAL TUBE FITTINGS



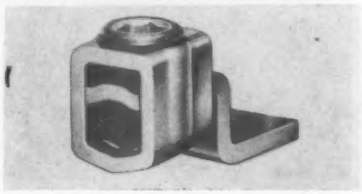
A wide range of fittings in special shapes and sizes are available in cadmium plated steel, black phosphate, stainless steel or other materials.

Engineering services are offered in response to inquiries for any special shape, size, material or in the solution of hydraulic fitting problems.

The Lenz Company, 3301 Klepinger Rd., Dayton 1, Ohio.

Use postpaid card. Circle No. 36

SEAMLESS COPPER TUBING CUTS CONNECTOR COSTS



A dual-purpose solderless lug utilizes the high strength-weight ratio of seamless copper tubing for a line of power and electrical distribution connectors.

The connectors meet requirements for 100% conductivity, minimum heat rise and mechanical strength.

Easy to apply, a minimum number of sizes handle a wide range of wire dimensions. The electro-tin plated finish permits the lug to be used for either aluminum or copper conductors.

Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.

Use postpaid card. Circle No. 37

PURE SILVER FOR TRANSISTOR APPLICATIONS

Using a new atomic recombination process, 99.999+% pure silver for semiconductor and other applications is offered to industry.

BEST WAY TO SEAL HOLES!

LEE PLUG

Simply place plug in reamed hole. Drive in tapered pin until ends are flush. Controlled expansion causes grooves to "bite" into casting, assures a bone dry seal that withstands pressures up to 40,000 psi. Now widely used on aircraft and missiles, and for pumps, servo valves, regulators, etc.

*Pat. #2,821,323

LEE COMPANY
OLD SAYBROOK, CONN

WRITE TODAY FOR COMPLETE ENGINEERING DATA

Use postpaid card. Circle No. 245

For General Time Corporation

PRODUCTION ANSWERS FALL INTO PLACE, SAVE $56 per 1,000 UNITS WITH SCOTCH-WELD®

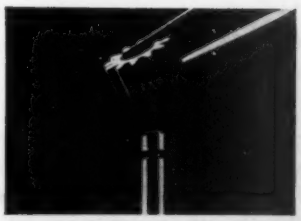
BRAND STRUCTURAL ADHESIVES

Before a SCOTCH-WELD Brand Structural Adhesive joined the assembly line, attaching tiny gear heads to mounting pins was a tedious and costly operation for Haydon Division, General Time Corporation, Torrington, Conn. High-temperature brazing frequently distorted gear configuration, warped shafts, upset metal hardness. A 100% inspection, with rejects aplenty, was required to assure watch-like accuracy in the final product—synchronous timing motors.

A 3M Field Engineer suggested SCOTCH-WELD EC-1386. In production, bonding gears to shafts with this epoxy-type adhesive eliminated the distortion-causing heat problem, ended high rejects, made 100% inspection unnecessary. The void-filling properties of EC-1386 reduced tolerances required between shaft and gear. And best of all, savings of $56.37 per thousand assemblies resulted!

Chances are your company can save money, speed production, simplify putting new designs into production by taking advantage of SCOTCH-WELD Structural Adhesives or other adhesive products developed by dynamic 3M research. Ask the nearby 3M Field Engineer to show you how! Or write AC&S Division, 3M Co., Dept. SBZ-41, St. Paul 6, Minn.

"SCOTCH-WELD" is a reg. TM of 3M Co.



SCOTCH-WELD EC-1386 simplifies bonding gear to shaft by eliminating high brazing heat that distorted the tiny parts, changed metal hardness.

ADHESIVES, COATINGS AND SEALERS DIVISION

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

Use postpaid card. Circle No. 246

This paper carton casing machine, made by Cherry-Burrell Corporation, Cedar Rapids, Iowa, uses a total of 53 RIVNUT fasteners as nutplates for quick, economical assembly.

Results are impressive. Components are installed flush at minimum cost —the manufacturer reports assembly is quick and easy. The installation of screws in the RIVNUTS permits simple rearrangement of components in the field, when packaging requirements change. And the closed-end type of RIVNUT used prevents any foreign matter entering the structure—important since the machines are used for packaging food.

RIVNUTS are the only one-piece blind rivets with internal threads. If you'd like recommendations on a specific fastening problem, please send a print of your part. For descriptive bulletin, see Sweet's Product Design File, or write *Dept. AE-4, B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Akron, Ohio.*

B.F.Goodrich

RIVNUTS

Use postpaid card. Circle No. 247

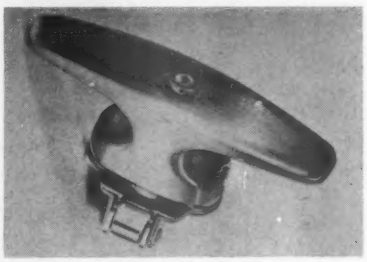
High Purity Metals' ultra pure silver is produced under constant surveillance using spectrographic and photometric equipment.

The silver is available in fine crystalline powder or as vacuum cast ingots, rolled strip or foil.

High Purity Metals, Inc., 340 Hudson St., Hackensack, N.J.

Use postpaid card. Circle No. 38

EQUIPMENT HANDLE HAS PUSH-BUTTON CONTROL



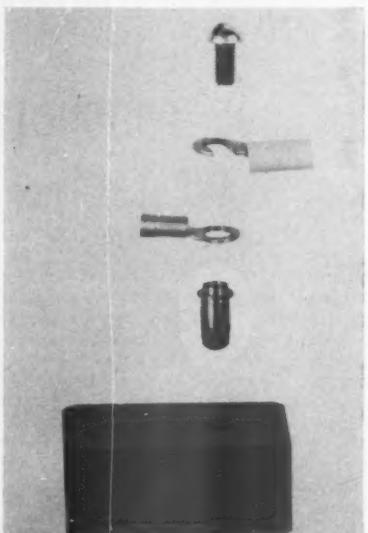
Compact, convenient push-button control and positive latching for electronic drawers, instrument panels, cabinets and doors is provided with T handle.

Made of cast aluminum, it is packaged complete with all necessary mounting hardware. Handle is ¾" wide, 3½" high, and protrudes 1⅜" from the front of the panel.

Chassis-Trak Incorporated, 525 S. Webster Ave., Indianapolis, Ind.

Use postpaid card. Circle No. 39

THREADED INSERT PROVIDES ELECTRICAL CONNECTION



A line of expansion inserts, designed to provide durable brass threads in molded plastic, now includes inserts which provide electrical connections.

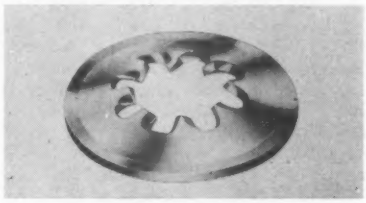
The Clinch insert is especially suited for such molded plastic parts as terminal blocks, switch components, and related electrical parts.

An eyelet, which protrudes above the surface of the workpiece, is the insert's primary feature. By placing a terminal or contact strip over the eyelet and then crimping the eyelet over the terminal a strong and highly conductive electrical connection is formed. Lead wires may then be attached to the connection by a conventional binding screw threaded into the insert.

Phelps Manufacturing Division, Heli-Coil Corporation, Shelter Rock Lane, Danbury, Connecticut.

Use postpaid card. Circle No. 40

LOCK WASHER PROTECTS PLASTIC FROM DAMAGE



A flat rim dish lock wash offers many advantages for switch and control unit applications.

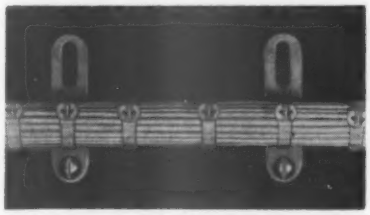
It is especially designed to fasten components to plastic and die cast bodies. The rim is proportioned to support the fastening load without injuring the plastic by overstress or milling action. The conical body provides spring loading for the locking teeth to protect the unit against loosening due to vibration, cold flow of material, or dimensional changes caused by temperature variations.

The washer comes in a variety of sizes to fit the small recesses or confined areas frequently found in electrical equipment. It is available as a free washer or can be made as a one piece pre-assembled unit with either screw or nut.

Shakeproof, Division of Illinois Tool Works, St. Charles Rd., Elgin, Ill.

Use postpaid card. Circle No. 41

UNIVERSAL PREMOUNTABLE HARNESS CLAMP

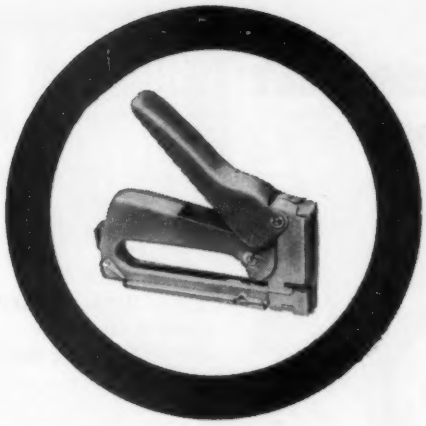


A premountable harness clamp takes a complete range of harness sizes up to 4". Once the clamp is installed, it does not have to be demounted should the harness need reworking. Two mounting bolt holes provide firmer clamping.

Used in conjunction with Ty-Rap cable ties and straps, the clamp and a tie replaces fifty-two sizes of conventional clamps.

The Thomas & Betts Co., 36 Butler St., Elizabeth, N.J.

Use postpaid card. Circle No. 42



FASTER!

Truarc Rings cut assembly time 60%

This production advantage was achieved by Swingline, Inc., with two Truarc retaining rings: a Series 5139 Prong-lock ring and Series 5144 Reinforced E-Ring. They also saved $25 per thousand units and improved the product design by providing resilient end-play take-up . . . eliminating looseness or binding in the parts. Truarc dispensers—loaded with pre-stacked ROL-PAK® cartridges—make ring application simple, fast and economical.

Truarc Rings come in 50 functionally different types . . . as many as 97 different sizes within a type . . . 6 metal specifications and 13 finishes. Write for Catalog 10-58 which shows many specific examples of ring applications. For immediate action, call your nearest Factory Representative or Authorized Truarc Distributor. He's in your Classified Telephone Directory under: "Rings, Retaining."

1.2

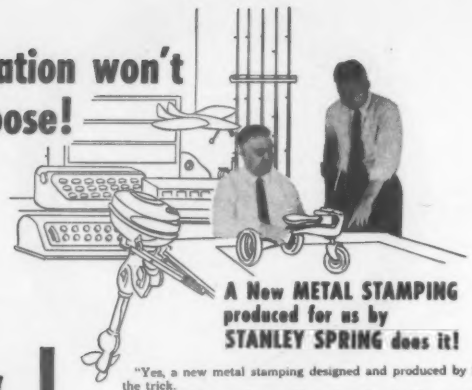
WALDES TRUARC® RETAINING RINGS

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N. Y.

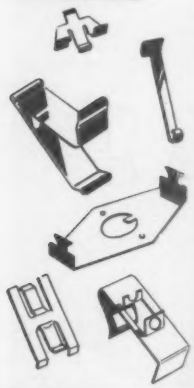
9 OUT OF 10 PRODUCTS CAN BE IMPROVED WITH TRUARC RETAINING RINGS

Use postpaid card. Circle No. 248

NO! Vibration won't work it loose!



ECONOMICAL . . .
EFFICIENT . . .
METAL STAMPINGS
FOR EASIER ASSEMBLY
DESIGNED BY STANLEY



A New METAL STAMPING produced for us by STANLEY SPRING does it!

"Yes, a new metal stamping designed and produced by Stanley Spring does the trick.

"Designed for quick assembly and produced at low cost, it will actually save us time and money in three ways.

"First . . . We save money because this metal stamping slips into place easily and quickly. It's a fast low cost assembly operation.

"Second . . . Our actual production cost for material, labor, tools, dies and everything that has to be included, is such that it makes it profitable for the company to have it produced by Stanley Spring.

"Third . . . We've tested this metal stamping. We know that it is as foolproof as anything can be. It stays in place no matter what kind of test we subject this part to. It will keep its position and do the job it's designed to do.

"Yes . . . Stanley Spring has given us a low cost metal stamping . . . that is easy to fit into our assembly lines . . . and, that will definitely do the job for us.

"Oh, yes! There is one other factor.

"Stanley Spring will produce a trial run for us almost as fast as we can get our order to them. They certainly will cooperate in every respect."

And . . . may we suggest . . . if you have any problems, any parts that can be produced on the finest metal stamping equipment . . . four-slide machines . . . wire forming equipment . . . or the most efficient spring manufacturing equipment . . . call Stanley Spring Manufacturing Company today.

Service . . . fast as flying!

STANLEY SPRING MFG. CO.
5050 W. FOSTER AVE. • CHICAGO 30, ILL. • SPring 7-2600
METAL STAMPINGS • SPRINGS • WIRE FORMS

Use postpaid card. Circle No. 249

"Ask the man from Townsend"

Versatility

. . . IS THE KEYNOTE TO TOWNSEND LOW COST AUTOMATION . . .

Scores of case histories prove that Townsend's FULL RANGE of machining operations result in FASTER production with LESS manpower. Here is UTMOST economy with GREATER accuracy . . . ALL this at a minimum capital investment.

For practical answers to your next machining and production problems, call Townsend. 196 aggregate years of practical experience are available to you at NO COST.

TOWNSEND AUTOMATIC hopper fed secondary operation machines for turning, drilling, pointing, grooving of headed blanks.

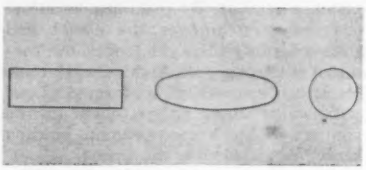
High-Speed Shavers • Riveters • Automatic Screw Machines • Special Machines • Duplex Spline Millers • Spring Presses • Drilling Machines • Drilling and Tapping • Fitting Machines • Indexing Tables • Metal Sawing Machines.

TOWNSEND OF HARTFORD
QUALI-MATIC MACHINES

THE H. P. TOWNSEND MANUFACTURING CO. • BROOK ST., WEST HARTFORD 10, CONN.

Use postpaid card. Circle No. 250

HIGH PURITY ANODES FOR PRINTED CIRCUITS



Tin-lead solder anodes of virgin metal so pure, impurities are limited to as little as .02% of bismuth and antimony are now available. Other impurities are in proportionally low amounts. Designed for plating electronic components and printed circuits, the anodes are available in extruded form.

The Alpha anodes are available in three shapes: round, elliptical and flat. Round anodes are extruded in 1½" to 2" diameters. Flat anodes come in a range of dimensions. Each shape is for use with any of a wide variety of reusable hooks or cast copper hooks solder-coated and bonded to the anode stock.

Alpha Metals, Inc., 56 Water St., Jersey City 4, N.J.

Use postpaid card. Circle No. 43

CAPTIVE PLASTIC FASTENER FOR INSTRUMENT PANELS

A plunger type fastener provides speedy and easy push pull fastening and unfastening of panels, doors, drawer fronts, and other sections.

The Nylatch fastener is composed of two parts, a molded plastic grommet and plunger, both of which remain captive in a removable panel or door or other section.

Only two holes with standard tolerances are required for installation. The grommet is designed to float for misalignment of holes. A single size fastener will accommodate a wide range of thicknesses to be fastened together.

The Hartwell Corporation, 9035 Venice Blvd., Los Angeles 34, Calif.

Use postpaid card. Circle No. 44

SILVER BRAZING ALLOY FOR STAINLESS STEEL ASSEMBLY

A nickel silver brazing alloy used on steel, chrome, molybdenum, manganese, stainless steel and other metals proves useful in the fabricating of small parts and in repairing machine tools made from tool steel.

Ambraze No. 111 is excellent for use on bicycles, instrument parts, tubular steel furniture, and light stainless steel

Answer to problem on page 50
Remember that a rocket leaving Earth on the 15th will meet at the launching pad the rocket which left Planet X on the 7th. The Planet X-bound rocket meets 17 Earthbound rockets. The solution may be found graphically with ease.

assemblies. In maintenance work, it is used for building up worn or broken teeth in gears or rebuilding worn trolley shoes.

The working temperature of the alloy is 1700° F. It produces a corrosion resistant weld deposit with a hardness of 160-170 Brinell, a shear strength in excess of 150,000 psi and a tensile strength of 80,000 psi.

American Brazing Alloys Corp., PO Box 11, Pelham, N.Y.

Use postpaid card. Circle No. 45

TEST JACK HAS STAMPED LUG ON REVERSE SIDE

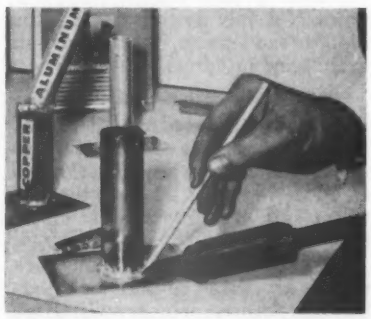
A test jack with a stamped lug on the reverse side of the chassis utilizes the press fit design for fast, permanent installation in a single hole.

The SKT-36 test jack is designed to receive a .050" diameter x .250" maximum probe. Beryllium copper contacts assure long service life, and minimum contact resistance. The stamped lug on the reverse side of the chassis is .287" long over-all and provides a .052" x .156" soldering hole.

Sealectro Corporation, 139 Hoyt St., Mamaroneck, N.Y.

Use postpaid card. Circle No. 46

FLUXLESS SOLDER FOR ALUMINUM DIE CASTINGS



A low temperature fluxless solder melts at low temperature, thus eliminating the danger of metal destruction under heat.

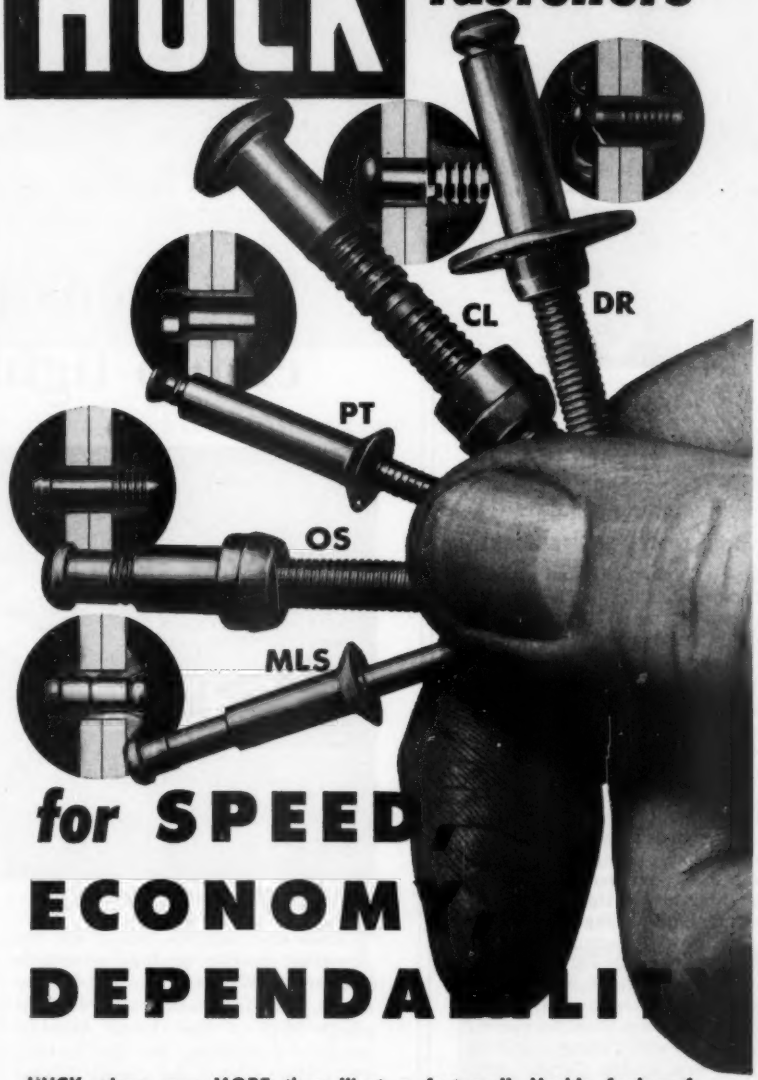
Tin-A-Lum has been developed for use on aluminum and its alloys, zinc, tin, pewter, magnesium and other metals as well as castings.

It is claimed that the all-purpose aluminum solder has proved to be of such tensile strength that it can replace welding and brazing in some instances.

Metals for Industry, Inc., 299 Pavonia Ave., Jersey City 2, N.J.

Use postpaid card. Circle No. 47

HUCK fasteners



for SPEED, ECONOMY, DEPENDABILITY

HUCK gives you MORE than "just a fastener". Huck's foolproof installation tools, convenient power units and versatile fasteners give you uniformity and speed of installation beyond your fondest hopes, even with inexperienced operators. Savings of up to seventy per cent on installed cost have been obtained by many users of Huck fasteners.

There is a HUCK fastener to meet your specific requirements whether they be high tensile or shear strength, blind application, thin sheets, wood-to-metal, broad bearing area, flush installation, high clinch, positive mechanical lock, elevated temperature, corrosion resistance or speed of application. A phone call can save you important production dollars. It costs you nothing to find out.

We invite your inquiries.

HUCK MANUFACTURING COMPANY

2480 Bellevue Avenue • Detroit 7, Michigan • Phone WA 3-4500

Use postpaid card. Circle No. 251

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By Fred E. Graves

Fastening of joints in corrosive environment

For a fastener to stand up in a corrosive environment it must either be coated, or made from an anti-corrosive metal.

THE METALLIC COATINGS

The "workhorse" applications are satisfied most economically with SAE Grade 2 or Grade 5 fasteners. Required outdoor durability is achieved with a plated or a hot galvanized finish. Hot galvanizing complicates good thread fits, costs more than plating in the popular size range, but gives much greater protection than any commercial plating.

A heavy galvanized coating is not recommended on highly stressed fasteners. If you need the high strength of Grade 5 bolts and want them corrosion-resistant, zinc plating should be your first choice. Certain conditions may require cadmium, nickel or copper plate.

THE ENDURING METALS

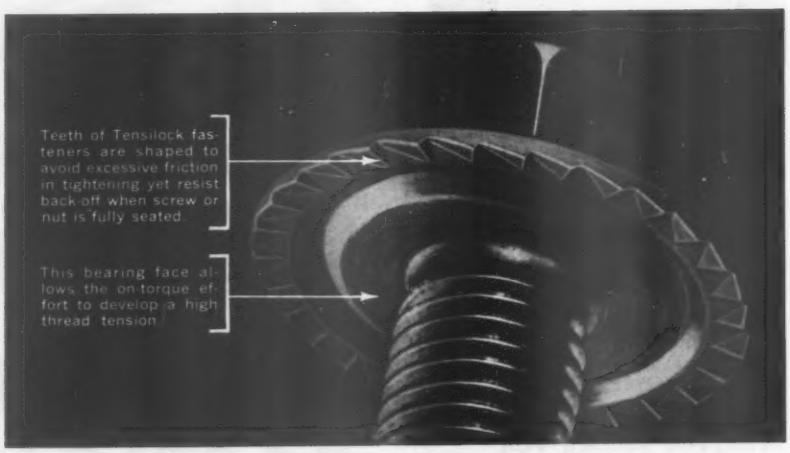
While each metal poses problems in certain applications, stainless steel, aluminum, and silicon bronze all offer distinct advantages.

Silicon bronze is popular for electrical uses due to its unusual strength, resistance to stress-corrosion, good conductivity.

Aluminum fasteners afford light weight as well as excellent conductivity. Anodized, they provide various colors; better corrosion resistance.

Widely used for fasteners, the 18-8 grade stainless steel assures good strength and excellent corrosion resistance in most atmospheres.

How Tensilock® Screws clamp tight, lock tight


Teeth of Tensilock fasteners are shaped to avoid excessive friction in tightening yet resist back-off when screw or nut is fully seated.
This bearing face allows the on-torque effort to develop a high thread tension.

TENSILOCK screws belong in the same league as high strength hex screws. With the same on-torque effort, the Tensilock units develop about 90% of the thread tension usually developed by the latter. Thus, they *both* make strong joints.

THREAD TENSION = CLAMPING FORCE

In theory, the higher the thread tension, the stronger the joint and the higher the inherent ability of the fastener to stay tight. In practice, you derive these benefits by torquing a high strength screw close to its *yield strength*. But what if you need high thread tension plus *extra* assurance that joints will stay tight? Then you have a job for Tensilock units. Not only do they develop the high thread tension, but also have an extra (and *integral*) locking device.

Screw Diameter		¼	⅜	½
Thread Tension (lbs.)	Tensilock	2,750	6,750	12,400
	High Strength Hex	2,975	7,250	13,300
On Torque (inch lbs.)	Both	120	420	1,000
Off Torque (inch lbs.)	Tensilock	150	525	1,250
	High Strength Hex	95	330	800

OFF-TORQUE = LOCKING POWER

By design, loosening torque of Tensilock fasteners exceeds tightening torque by 25% or more. This is an effective "lock." It gives that extra margin of safety against vibratory loosening.

To sum up: RB&W's Tensilock screws are stronger than Low Carbon Hex Screws; compare with High Strength Hex Screws in clamping force; are superior to them in locking action. Suggestion: For a strong locking *bolt*, use with Tensilock Nut. Send for Bulletin TL-2. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Sales office and warehouse at: San Francisco, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas.

Use postpaid card. Circle No. 252

USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite page 62.

SPECIALIZED SEALS

Two bulletins describe specialized seals for industrial, electronic, missile and high-performance aircraft applications. The first describes a seal designed specifically to meet high pressure and extreme temperature requirements of system components; the second is devoted to polymer seals for reciprocating and low-speed rotary shafts operating under high-pressure liquid and gas conditions. Each of the bulletins describes in detail the seal characteristics, their design and function. Also included are complete sections of engineering design data coupled with recommended machining specifications. Del Manufacturing, 1584 E. 20th St., Los Angeles 11, Calif.

Use postpaid card. Circle No. 55

CAMS FOR ASSEMBLY UNITS

Technical catalog No. 901 describes standard, semi-standard and special plate cams. The eight-page bulletin shows engineering dimensional drawings of each of the types of cams. Also included are charts giving standard specifications and graphs showing relation between allowable maximum stroke, minimum movement time, and size of cam blank. Ferguson Machine Corp. of Indiana, 7818 Maplewood Industrial Ct., St. Louis 17, Mo.

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HI-STRENGTH SOLDER ALLOY

Technical data bulletin Z-105 describes a high-strength low-temperature solder alloy. It lists all data such as specific gravity, specific weight, compressive strength, fatigue strength, and tensile strength and hardness at various temperatures. Accurate Specialties Co., Inc., 345 Lodi St., Hackensack, New Jersey.

Use postpaid card. Circle No. 57

PRECISION FASTENERS

Precision fasteners for aircraft, missile, and electronics industries are discussed in a 16-page color brochure. Presented also in the brochure are photographs and descriptions of company's engineering, planning and production departments, and fastener manufacture. Air Industries of California, 1559 W. 134 St., Gardena, Calif.

Use postpaid card. Circle No. 58

PLASTICS COMPARISON

Comparisons of the major properties offered by nine leading industrial plastics are summarized in graphic form in a twelve-page report on cost performance. The report compares and evaluates the major properties of Cycolac brand polymers and eight other plastics. It is based on recently published data from each manufacturer. Six separate graphs compare the plastics for overall performance in cost, heat deflection at 264 psi, impact strength at room temperature, impact at low temperature, tensile modulus or rigidity and hardness. Marbon Chemical Division, Borg Warner Corp., Box 68, Washington, West Virginia.

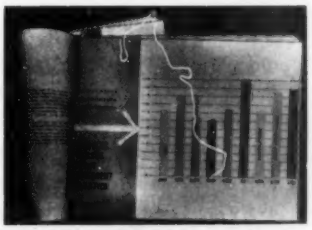
Use postpaid card. Circle No. 59

SILVER BRAZING

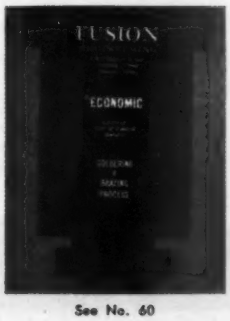
A four-page, two-color brochure on the economic automation processes in soft soldering and silver brazing describes the method of automating production soldering and brazing operations with paste alloys. It also describes briefly three series of paste materials available and gives four case history examples of cost savings achieved through installation of automatic, semi-automatic and manual equipment. Fusion Engineering, 17921 Roseland Ave., Cleveland 12, Ohio.

Use postpaid card. Circle No. 60

See No. 58



See No. 59



See No. 60

CHAIN CONVEYORS

Typical installations of chain conveyor systems are described in 38 page booklet. Included also are engineering data charts showing standard conveyor attachments, compound track curves and conveyor system accessories. Richards-Wilcox Mfg., Co., Aurora, Ill.

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DESIGN TEMPLATES

Full scale tracing templates for use by tool designers for jigs, fixtures and special machinery are given in eight page engineering folder. It includes over 200 components used most often by the industry. Northwestern Tools, Inc., 117 Hollier Ave., Dayton 2, Ohio.

Use postpaid card. Circle No. 62

PIN & SOCKET CONNECTORS

An illustrated six-page folder describes a complete line of pin and socket type multiple connectors, and details the electrical and mechanical characteristics of the line. It also lists the salient features of the five types of contacts available and the features of the connector shells and inserts. A list of connector accessories available is also given. AMP Incorporated, Harrisburg, Pa.

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INDUSTRIAL FASTENERS

An eight-page condensed bulletin describes complete line of standard precision industrial fasteners, including socket screw products, pressure plugs, locknuts, spring pins, dowel pins and steel collars. Bulletin 2449 details basic data on types, sizes, thread and plating and spells out design features and application information as well. Fast reading specification information on materials, thread and size ranges is contained in a series of tables, each supplemented by sketches identifying the type of fastener. A. Roesler Standard Pressed Steel Co., Box 1121, Jenkintown, Pennsylvania.

Use postpaid card. Circle No. 64

INSERTS FOR PLASTICS

How push-type insert is used to form strong threads in plastics after molding is described in bulletin 777. A table lists the sizes, dimensions of each size and quantity prices. Heli-Coil Corporation, Shelter Rock Lane, Danbury, Connecticut.

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HOSE FITTING ASSEMBLIES

A color coded, eight-page catalog, designed to make the ordering of hose fitting assemblies easier, covers hose fittings and assemblies that are detachable, reusable and designed for medium and high pressure industrial use. Featured are illustrated specification tables of braid hose and fittings, medium pressure hose assemblies, hose adapters and swivels. Color coding makes it easy to order variations in end fittings. The Lenz Company, 3301 Klepinger Rd., Dayton 1, Ohio.

Use postpaid card. Circle No. 66

COLD HEADING MACHINERY

Four page catalog No. 360 shows single and double stroke cold headed machinery, and photographs of typical products produced by them. Included also are specifications for the double stroke solid die, and single stroke solid die cold header. Behr Machinery & Equipment Corp., 1208 Seminary St., Rockford, Ill.

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PROGRESSIVE IS FIRST WITH THE FINEST IN "JOB-ENGINEERED" RESISTANCE WELDING EQUIPMENT

Over twenty-five years of outstanding experience in the welding field makes Progressive your best bet for the finest resistance welding equipment and fixtures. A dependable part of the welding picture in almost every important manufacturing plant here and abroad, Progressive equipment has proved its quality and superiority right on the job.

Our engineers will gladly assist in the solution of your production problems.

Shown here are a few examples of Progressive's many types of equipment for every welding requirement.

PROGRESSIVE WELDER & MACHINE CO.
915 Oakland, Pontiac, Mich.

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FASTEN/ATION

The mechanics of modern fastening have matured to the point where it is now considered a science. We call it FASTEN/ATION.

Your designs are important enough to build, and should be covered and protected . . . but you must be able to remove the covering in a hurry. Here's where Camloc's FASTEN/ATION becomes significant to you. Installation is simple – closure is simple – opening is even simpler, and each of these operations takes only seconds.

The final touch to a good design includes the best method of fastening, the simplest installation and use, and a fastener that complements the product in size and appearance. Since making a decision involves the evaluation of alternatives, here are some of Camloc's more popular fasteners. We know you will want to make a more careful analysis before you specify, we suggest that you write for our complete catalog. Be FASTEN/ATED! Let us FASTEN/EER your next design.

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LONG, THIN PINS, RIVETS

COLD HEADED

FAST...

ACCURATELY...

MORRIS-OMEGA

Special Model "O" OPEN DIE Double Stroke Header, produces long thin parts in diameters from .020" to .090" up to 2⅜" long at rates up to 100 per minute!

Also available: Solid Die Headers for wire diameters as small as .012".

For Complete details and prices, Write:

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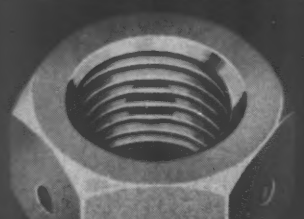
STOLLOCK NUT

U.S. Patent Numbers
2,754,871 2,859,459
Canadian Patent No. 537967



Be SAFE . . . SAVE MONEY, TIME, LABOR!

Get the BEST with these exclusive features:

- Starts freely from either side
- Torque controlled to your specifications
- Full thread engagement with bolt
- Locking action starts with less turns
- Nut body is not distorted
- Available in Grades "A"-"B"-"C" (Heat Treated)

Manufacturers of Marsden, Standard and Special Nuts

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SOME SALES TERRITORIES OPEN—INQUIRIES INVITED

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MINIATURE HAND TOOLS

Midget pliers, cutters and other hand tools for use in assembling miniature electronic products, as well as for working in confined places, are included in Utica's hand tool catalog No. 67. All tools described are precision, finely finished tools. Utica Drop Forge & Tool Division, Kelsey-Hayes Co., Utica 4, N.Y.

Use postpaid card. Circle No. 68

SPECIAL FASTENERS

Special fasteners for the aircraft, missile and electronic industries are described in four page folder. Such fasteners as honeycomb spacers, flare skirt dome nuts and press-lock headers, are photographically described. Components Engineering & Mfg. Co., Inc., 5468 Valley Blvd., Los Angeles 32, Calif.

Use postpaid card. Circle No. 69

BRAZING FURNACES

Eight page brochure GED-4304 describes gas and electric roller hearth furnaces for high production, economical annealing, hardening, brazing, sintering and general heat treating. Four pages of drawings and copy explain design features of various components of the furnaces. Different types of heating chambers are also discussed. Diagrams show furnaces most suitable for each treating process, and specifications chart gives application data. General Electric Co., Schenectady 5, N.Y.

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ELECTRICAL CONNECTORS

An illustrated index is the feature of 14-page electrical connector and accessory catalog. In addition to illustrations of the product, charts giving dimensions and other pertinent data are included. Western Insulated Wire Co., 2425 E. 30th St., Los Angeles 58, California.

Use postpaid card. Circle No. 71

CAM INDEXING UNITS

Engineering and cut-away drawings of basic and basic locking indexing units are given in 22-page engineering

guide. Included also are tracing templates for the units and standard dial plates and hubs. Standard Tool & Manufacturing Co., 237 Laurel Ave., Kearny, N.J.

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ILLUMINATED MAGNIFIERS

Full line of illuminated magnifiers and microscopes are described in illustrated brochure. Special models such as electrical reading lens, ten power inspection magnifier and a pen microscope are also presented. E. W. Pike and Co., 577 Pennsylvania Ave., Elizabeth, New Jersey.

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SET SCREWS

Set screw containing a nylon insert, which prevents burring or nicking of precision shafts, and insures locking power as the nylon compresses into the thread of the holding member is described in four-page bulletin. Stock list of screws in sizes from No. 2-56 to ¼-20 is also included. PIC Design Corp., 477 Atlantic Ave., East Rockaway, L.I., N.Y.

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LARGE FASTENERS

Threaded rods, forged nuts, bolts and construction use fasteners ranging in size from 1¾" to 12" are photographically described in information folder. Joseph Dyson and Sons, Inc., 5125 St. Clair Ave., Cleveland 3, Ohio.

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MAGNETIC TORQUE TOOLS

Precision magnetic torque wrenches and screwdrivers are described in four page bulletin. Included also is specification chart showing available types, torque range, dimensions and prices. Stuart D. Patterson Co., Inc., PO Box 3544, Rochester, N.Y.

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SEAM WELDER

Bulletin 320-8 fully describes three-phase seam welder designed to cover a wide range of commercial and military welding applications. It is supplemented with illustrations together with dimensional drawings. Machine data is tabulated to indicate available KVA range, throat depths, welding currents, and electrode forces. Sciaky Brothers, Inc., 4915 W. 67th St., Chicago, Ill.

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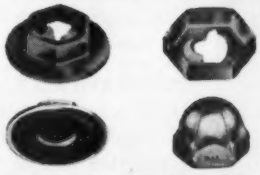
SIMPLIFY YOUR FASTENINGS to cut Assembly Costs!

Use quality-controlled PALNUT FASTENERS for vibration-proof assemblies -- with savings in costs --parts --operations--space--weight--assembly time

FOR THREADED MEMBERS

PALNUT LOCK NUTS A single spring-tempered steel PALNUT Lock Nut replaces bulkier tapped nut, separate lockwasher, flat washer, sealer washer, according to application. Frequently cost less than plain nuts alone. Save weight and space, assemble fast, hold tight with spring locking action.

FOR UNTHREADED STUDS, ROD, WIRE



PALNUT SELF-THREADING NUTS

Save threading costs. Form their own deep, clean threads while tightening on plain studs, rod or wire of any malleable material. Fast assembly with standard tools. Vibration-proof grip.

PUSHNUT® FASTENERS

Push on unthreaded studs, rod, wire or rivets. Eliminate threading, grooving, drilling, cotter pins. Low in cost, fast assembly, strong grip.

Write for catalogs and free samples, stating type, size and application.
See our catalog in Sweet's Design File

PALNUT®

THE PALNUT COMPANY
DIVISION OF UNITED-CARR FASTENER CORPORATION
79 Glen Road, Mountainside, N. J.
Canada: P. L. Robertson Mfg. Co., Ltd., Milton, Ont.

LOCK NUTS and FASTENERS

Use postpaid card. Circle No. 257

WING NUTS

Stock list of special wing nuts enables manufacturers to select from hundreds of specials to solve fastener problems requiring the use of wing nuts. Engineering drawings describe basic wing nuts with special bosses available. Also included are tables listing blanks and thread combinations, as well as blank and untapped hole diameter combinations. Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N.Y.

Use postpaid card. Circle No. 78

ELECTRONIC HARDWARE

Catalog permits ordering from one source, hardware for aircraft, missiles and electronic apparatus. In its pages are specifications for a wide range of screws and bolts, rivets, nuts, washers, pins and all types of commercial fasteners in standard and hard-to-find items. Included are illustrations of popular rivet head styles and standard head markings. Alter Bolt Co., ABCO Aircraft Hardware Div., 1944 N. Second St., Philadelphia 22, Pa.

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TORQUE CALIBRATOR

Bulletin 210 describes the operation and application of a portable torque wrench calibrator. It lists complete specifications and dimensional data for the six models, covering torques up to 2000 ft. lbs. Technical information is tabulated for easy-to-read reference. Skidmore-Wilhelm Mfg. Co., 442 S. Green Rd., Cleveland 21, Ohio.

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BAND CLAMPS

A 16-page booklet contains illustrations and condensed information on a variety of standard clamps used throughout the automotive, aircraft, appliance, agricultural and general manufacturing industries for hose, flexible plastic pipe, and duct connections. A number of custom-made clamps for unusual applications are also described and illustrated. Wittek Manufacturing Co., 4305 W. 24th Place, Chicago 23, Ill.

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ROLLER GEAR DRIVES

Precision roller gear drives for automatic machinery applications are described in engineering folder. Scaled engineering drawings show installation of gear drives in several different indexing units. R. Petroff Associates, 5101 W. Lake St., Chicago, Ill.

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PUSH INSERTS

Brochure on taper-thread and push inserts describes the advantage of using expandable type inserts in plastic parts after molding versus molded-in inserts. Drawings illustrate procedure for installation in various applications. A chart on standard sizes is also outlined in the four-page bulletin. Fastener Products, Inc., 239 Danbury Rd. Wilton, Connecticut.

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SPECIAL WIRE FORMS

Twelve page technical brochure presents glossary of wire terms and applications of wire formed products. Included also are illustrated drawings of standard wire forms and a ready reference wire gauge chart. Merrill Manufacturing Corp., 106 N. Genesee, Merrill, Wisconsin.

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ZINC COATINGS MANUAL

Definitive inspection manual covers protective zinc coatings on products hot dip galvanized after fabrication.

NOW! CUT YOUR ASSEMBLY COSTS THESE 5 WAYS

Single Machine Presses and Stakes Automatically

SET UP IN LESS THAN ONE MINUTE — cut capital equipment investment, save space.

ELIMINATE SUBASSEMBLY INVENTORIES — assemble from primary components, saving scheduling, parts transfer and tool changeover time.

CUT SCRAP LOSS, DESIGN LIMITATIONS — set close tolerances (within .001!) without risking damage or distortion in staking, even with non-metallics.

USE THE MATERIALS YOU WANT — stake with a tap barely heavy enough to set a tiny eyelet, or with over-one-ton impact.

AUTOMATICALLY — combined press-stake-eject cycle is completely automatic, for production rates to 1400 assemblies per hour.

PRESSTAKER is an assembly tool that combines press-fitting with final staking at rates impossible with separate machines. Models available for almost every assembly job. Hundreds in use by companies you know.

LEARN HOW you can turn assembly costs into profits. Send for fact-filled Bulletin A-4.

THE NEW CRAMER

PRESSTAKER

Machine Tool Division – CRAMER CONTROLS CORPORATION – Centerbrook, Conn.

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FASTENERS FOR AIRCRAFT AND MISSILES

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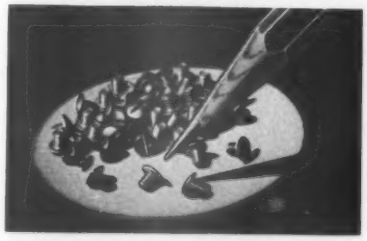
IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

Manufacturers of Cold Headed Fasteners Since 1888

OVER 5 TIMES THE RATE AT 45% LESS COST



Another example of how Hubbell Cold Heading produces Better Parts at Faster Speeds, at Lower Cost

THE PART:
Special 1-64 Miniature Binding Screw

THE MATERIAL:
18-8 High Tensile Stainless Steel

THE METHOD:
Hubbell Cold Heading in place of screw machining

THE RESULT:
a. Production increased from original rate of 7000 pc. p.d. to cold heading rate of 40,000 pc. p.d.
b. Cost reduced 45%
c. Finer Quality—More Economical Production
1. Higher Tensile Strength
2. Cleaner, Stronger Threads
3. No Scrap Waste
4. No Separation from Chips

Hubbell Cold Heading may provide equally dramatic results for you. Whether it is presently cold headed or not, send blueprint of part or sample for analysis and estimate.

HARVEY
HUBBELL,
INCORPORATED
MACHINE SCREW DEPARTMENT
BRIDGEPORT 2, CONNECTICUT

Use postpaid card. Circle No. 259

The 34-page book describes significant factors governing inspection, properties, specifications, and purchasing of hot dip zinc coatings. American Zinc Institute, Inc., 292 Madison Ave., New York 17, New York.

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ELECTRONIC STANDARDS

Electronic engineering standards are given in 80-page catalog H-60. Divided in eight sections for easy reference, such items as convertors and taper pin receptacles, instrument panel hardware, terminals, printed circuit eyelets and terminals, and insulated feed throughs are fully described. Engineering specifications and design data for all parts are also included. Litton Industries, U. S. Engineering Co. Division, 13536 Saticoy St., Van Nuys, Calif.

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STANDARD SERVO CLAMPS

Servo clamps used to fasten housings of synchros, servomotors, potentiometers and many other types of hardware to mounting plates are fully illustrated through engineering dimensional drawings in data sheet. Theta Instrument Corp., 520 Victor St., Saddle Brook, N.J.

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ELECTRIC POWER TOOLS

Complete descriptions and specifications of electric power tools such as two speed drills, portable grinders, electric hammers, and cutting tools are given in technical information sheet. Stanley Power Tools, Myrtle St., New Britain, Connecticut.

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ELECTRONIC WELDING UNITS

Complete line of electronic welding equipment is shown in three-page fold-out information sheet. Special features of each type of unit, as well as special applications are included. Hughes Aircraft Co., Vacuum Tube Products Division, 2020 Short St., Oceanside, Calif.

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WIRING DEVICES

Twelve new products are announced in a 36-page pocket size catalog. Included are self-drilling anchors, core drills, percussion drills, machine screws, hex nuts, washers, snap-straps and polypropylene plastic clamps. The catalog also includes specifications and descriptive information on full line of wiring devices, fuse specialties, fastening devices and masonry drills. Holub Industries, 400 Elm St., Sycamore, Ill.

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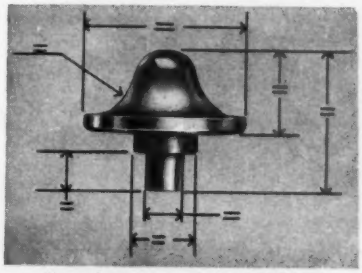
IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

Manufacturers of Cold Headed Fasteners Since 1888

OVER 10 TIMES THE RATE AT 50% SAVING IN RAW MATERIAL



Another example of how Hubbell Cold Heading produces Better Parts at Faster Speeds, at Lower Cost

THE PART:
Click Button

THE MATERIAL:
Brass

THE METHOD:
Hubbell cold heading in place of screw machining.

THE RESULT:
This brass click button was machined previously from bar stock, involving several different operations that removed nearly 50% of the total weight of the original stock . . . a wasteful, time-consuming, costly process.

Hubbell now produces essentially the same part at tremendous savings in time and material cost.

a. Production is increased from the original rate of 5.5 pcs. p.m. to cold heading rate of 60 pcs. p.m.
b. Labor, overhead and material cost has been reduced 36%.
c. The finished part is stronger, more accurate, with greater uniformity.

Hubbell Cold Heading may provide equally dramatic results for you. Whether it is presently cold headed or not, send blueprint of part or sample for analysis and estimate.

HARVEY
HUBBELL,
INCORPORATED
MACHINE SCREW DEPARTMENT
BRIDGEPORT 2, CONNECTICUT

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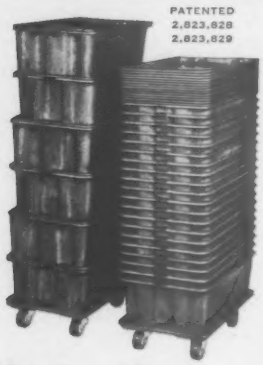
Lewis Containers SOLVE EVERY HANDLING PROBLEM



PATENTED
2,823,628
2,823,629

Stack-n-Nest®
TOTE PANS

Only Lewis Stack-n-Nest tote pans stack and nest, within their own dimension, without any mechanical gadgets. Molded in one piece of Fiberglass reinforced polyester . . . can't dent, rust, rot or warp. Available in 8 sizes from 16"x10"x5" to 34"x24"x19", in grey, green, and red. Accessories include pan covers and 4-caster dollies. **Shipment within 24 hours from receipt of order.**

PLASTIBOX UNITIZED ASSEMBLY CONTAINERS

One piece, molded plastic. Strong, smooth, non-corrosive, easily cleaned. Stack securely and afford maximum storage of parts; 4 sizes in green or yellow. Accessories are available for a wide variety of bench or wall mounting. Truck assembly allows boxes to be quickly moved. **Shipment within 24 hours from receipt of order.**

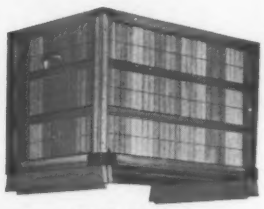
PATENTED
2,823,626
2,823,629

PolyLewton FOOD HANDLING PANS

Stack-n-Nest pans are available in this remarkable material developed for raw food handling. The glass-like surfaces are easily cleaned, have no crevices to harbor bacteria. Inside dimensions are 20"x12"x8", weigh 3¾ lbs., handle up to 50 lbs. **Shipment within 24 hours from receipt of order.**

WOVEN WOOD-and-WIRE HANDLING CONTAINERS

Tough, resilient wood-and-wire webbing is combined with a select hardwood frame, jointed at corners and reinforced with steel corner irons . . . here are husky, long-lived, big capacity containers available in many sizes and styles, including trucks and collapsible boxes. Designed for single or multiple handling with modern handling systems and equipment. **One to three week delivery.**



WRITE TODAY
for illustrated brochures on the complete Lewis material handling container line.

G.B. Lewis COMPANY
204 Montgomery Street, Watertown, Wisconsin

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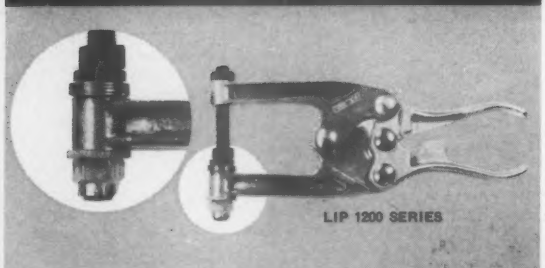
NEW *KNU-VISE* LOAD INDICATING PLIERS GUARANTEE CLAMPING FORCE



These pliers are for applications where it is essential, and often critically so, that a certain clamping force be applied time after time—*regardless of the thickness of the work.*

In use, the adjusting spindle is set for the desired clamping force by trial clamping. When the proper force is obtained, the self-locking nut on the anvil is then adjusted so that the LOAD INDICATING WASHER moves "just smoothly" with the plier clamped on the work. Thus, once a certain clamping force has been established it can be readily duplicated on any other work thickness simply by adjusting the spindle so that the LOAD INDICATING WASHER again moves "just smoothly" after clamping.

Write for complete information.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

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WESTERN DIV.: PECK and LEWIS CORPORATION
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1131 Pettit Road, Burlington, Ontario

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FASTENATING PROBLEM: what's the big difference here?

On the left, a conventional metallic fastener. On the right, a Nylogrip nylon fastener. The big difference: Nylogrip is an excellent insulator, eliminates need for collars and washers. Nylogrip is corrosion and chemical resistant. Nylogrip is self-locking, eliminates need for locking devices. Nylogrip is more than 50% lighter, yet has tensile strengths up to 15,700 p.s.i. Nylogrip is available in a full range of colors. Nylogrip is highly heat resistant — form stable up to 450° F, withstands up to 300° F continuous heat with special nylons. Best of all: Nylogrip has largest available stock of non-metallic fasteners. Economical small lot prices, fast delivery. Specials engineered to your requirements. **WRITE FOR DETAILS.**

NYLOGRIP NYLON FASTENERS — Stocked in most head styles; diameters: #2 through ½"; lengths ⅛" through 2"; hex nuts, flat washers, set screws — threaded rod — lock nuts — nylon balls — PVC fasteners — Nylogrip Dubo Lockwashers.

NYLOGRIP PRODUCTS
566 Pleasant Street,
Watertown 72, Mass.

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INDUSTRY MAKES NEWS

When the hooks are adhered, the booms are extended from the cargo doorway of C-119 aircraft. Each of the two booms is 32 ft. long and they are designed to suspend the rope-loop harness behind and below the plane for scooping up the capsule.

Crew member of Air Force 6594th control group attaches capsule catching grappling hooks with pressure sensitive tape.

JANUARY FASTENER SHIPMENTS

The seasonally adjusted index of fastener shipments for January, 1961 were 75% of the 1956-58 average of 100%.

Cutbacks in automotive production and the adverse effect of a severe winter in the construction industry, were cited by the Industrial Fastener Institute as a factor in the low rate of shipments. Both industries are major users of fasteners.

U.S. STEEL DISPLAYS HIGH STRENGTH BOLTS

The use of steel and steel products in the building of American highways was the subject of an exhibit by U. S. Steel before the American Road Builders Convention in Atlantic City in March, 1961.

Emphasizing the importance of small items, as well as big ones in road construction, the exhibit included a recently developed high strength bearing bolt. It is a threaded fastener combining the desirable features of a hot driven rivet and a standard high strength bolt, which helps insure stronger structures.

ADHESIVE TAPE AIDS SPACE PROBE CATCH

Space capsules falling from the sky are being caught with a helping hand from pressure sensitive tape.

The Air-Forces' 6594th Recovery Control Group reports that a crepe-paper masking tape adheres the big metal grappling hooks in place for snagging the capsule's parachute, and breaks at just the precise time to enable the capsule to be reeled rapidly into the airplane.

So successful has this new tape application become that it was used recently to help catch the Discoverers XIV and XVIII satellites near Hawaii.

According to the Air Force, the tape was selected for such exacting work because it was essential to use an adhering material which could work in perfect timing with the accuracy and precision required to pluck a satellite capsule from mid-air and bring it directly into the crews hands.

top production economy

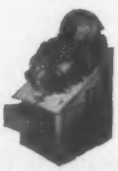
ROY SP-1

HIGH SPEED

HEADER

If you cold-head screws, bolts, rivets or similar parts you owe it to yourself to see the ROY SP-1 (SDDS) High Speed Header. This value-packed Header is of advanced design cold-heading 275 *precision* pieces per minute on ¼" diam. and smaller blanks — up to 1½" in length. The ROY SP-1 gives top performance because it is made to top quality standards! Send for complete information on this profit-builder today.

Another Famous Member of the ROY "Family" — Model C SCREW SLOTTER



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NEW BRITAIN AVE. • FARMINGTON, CONN.

The .0075" thick tape, Minnesota Mining and Manufacturing Co.'s "Scotch" brand No. 202 masking tape, breaks immediately when the hooks snag the small parachute of the capsule during its descent. Because of this snagging, the capsule is halted just long enough to enable the harness, dangling from behind the plane, to ensnare the capsule in its large loop.

The taping is a simple project and can be accomplished rapidly, according to the Air Force.

ROTOR TOOL PROMOTES THREE

VAN SITTERT

WHITEHOUSE

DWORS

Paul Van Sittert was named to the board of directors of the Rotor Tool Co., Cleveland. Also named to new positions were Hugh L. Whitehouse, promoted to vice president and secretary and Leonard W. Dwors, promoted to treasurer of the firm.

Van Sittert was named director of research for the company in 1960. Prior to that appointment he was chief development engineer.

Whitehouse is presently company director of engineering, and he will continue in that capacity under the new executive grouping.

Dwors has been with Rotor Tool for the past 25 years. He was formerly works manager, and was named vice president, manufacturing last year.

REORGANIZED TULSA BOLT FIRM TO EXPAND

VB Products, Inc., Tulsa, Okla., is the name of a new firm which has purchased the facilities of the former Tulsa division of Valley Bolt Corp.

Warren H. Franks heads the new company as president and board chairman; he had been executive vice president and general manager. Robert W. Harness has been named vice president; Mary Jane Ferguson, secretary; Joseph W. Turner, general sales manager.

The company specializes in fasteners and other precision components for aircraft and missiles. A 7500 square foot addition will be added to the plant in the near future.

LEACH NAMED TO OMARK MANAGEMENT POST

Austin F. Leach has been appointed manager for product planning and market research at Omark Industries, Inc.

Formerly sales manager for the company's stud welding equipment line, Leach in his new position will co-ordinate additions and modifications to the company's product line and will supervise market analysis.

Before coming to Omark, he was manager of manufacturing and engineering for the A. L. Smith Iron Co., Cambridge, Mass. He had also been manager of equipment planning and product service for the Welding Department of the General Electric Corporation.

EXPLOSIVE BOLTS DISCUSSED AT SEMINAR

Explosive bolts which may be the method used to assemble space stations in the sky, were discussed at a National High Energy Rate Forming seminar and conference in Philadelphia in March.

← Use postpaid card. Circle No. 264

The metal fasteners contain explosive charges. After being inserted through two pieces of metals, they are detonated, causing the fastener to spread, holding the metal together. High hopes are being held for these new types of bolts, which are now being used in missile manufacture.

DE-STA-CO NAMES GENCUR ASST. S.M.

Andrew F. (Jimmy) Gencur has been named assistant sales manager-finished products division of the Detroit Stamping Co. Gencur has spent his entire business life with the company, joining them in 1928. He progressed through various shop and production assignments to become foreman of the Finished Products Manufacturing Division, and, in 1945, was named a sales engineer of the division.

NEW FEDERAL PACIFIC ASSEMBLY PLANT

In connection with the consolidation of its switchgear production, Federal Pacific Electric Co. will build a $500,000 plant in Newark, N.J. The plant will be used for final assembly of heavy electrical equipment. Components for the assembly are made in five adjacent existing buildings at the site.

WEIGERT JOINS PENN STATE ENG. STAFF

Karl M. Weigert, Ph.D., has joined the staff of the department of industrial engineering at The Pennsylvania State University, University Park, Pa., as an assistant professor of metal working and joining.

Formerly senior research metallurgist at Curtiss-Wright Corp., Dr. Weigert has authored many articles on brazing, soldering and welding. One of these articles, "Shear Strength of Brazed and Soldered Joints," was published in the November 1959 issue of Assembly and Fastener Engineering.

EXEC REALIGNMENT AT STANDARD SCREW

MONGERSON

PERRIN

PLEINES

Standard Screw Company, Bellwood, Ill., has announced the realignment of executive responsibilities involved in the over-all operation of the company.

Paul A. Mongerson will directly supervise the operation of the Chicago Screw Co. Division, Bellwood. He was named vice president and general manager of the division.

Michael J. Perrin will have direct control over the operation of the Hartford Machine Screw Co. Division in Hartford, and is now its vice president and general manager.

Theodore R. Pleines has been promoted to vice president and general manager of the Western Automatic Machine Screw Co. Division, Elyria, Ohio, and he will be responsible for the division's operation.

GM TO AID SEAT BELT USERS

General Motors has announced that it will provide installation aids for seat belt users as standard equipment for the front seat of all 1962 passenger cars.

The installation aids will consist of special fittings to which motorists can attach seat belts without the necessity of drilling or using special tools.

faster, lower-cost production

HARTFORD 400 AUTOMATIC THREAD ROLLER

ALL NEW

Here's a *major* advance in automatic thread rolling — the new Model 400 by Hartford Special with *capacity up to 400 pieces per minute.*

PLUS simplified design for ease of set-up and maintenance. And many new features such as vinyl-lined hopper, separate coolant systems, etc.

THREAD LENGTHS from ⅛" thru 1½"; up to 3" with special dies.

SCREW CAPACITY from #2 thru #10 on Automatic Model; #0 thru #10 on Manual Model.

USES economical standard flat dies.

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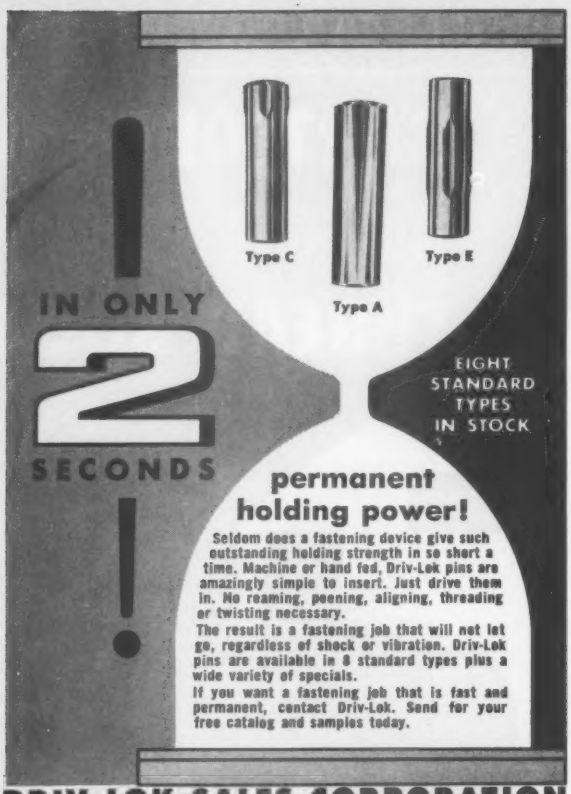
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permanent
holding power!
Seldom does a fastening device give such outstanding holding strength in so short a time. Machine or hand fed, Driv-Lok pins are amazingly simple to insert. Just drive them in. No reaming, peening, aligning, threading or twisting necessary.
The result is a fastening job that will not let go, regardless of shock or vibration. Driv-Lok pins are available in 8 standard types plus a wide variety of specials.
If you want a fastening job that is fast and permanent, contact Driv-Lok. Send for your free catalog and samples today.

DRIV-LOK SALES CORPORATION
731 Park Avenue, Sycamore 3, Illinois
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Standards and recommended practices with regard to seat belts have been developed by the Society of Automotive Engineers.

ROSAN APPOINTS MATHEWS, PURCELL

MATHEWS

PURCELL

George Q. Mathews has been named vice president in charge of sales and Andrew W. Purcell has been appointed project engineer in charge of special projects for Rosan, Inc., Newport Beach, Calif.

Mathews, formerly of Detroit, was associated with Huck Manufacturing Corp. as vice president in charge of sales. Purcell was formerly a components engineer in Hughes Aircraft Co.'s ground system division.

THREE POP RIVET REPS. ANNOUNCED

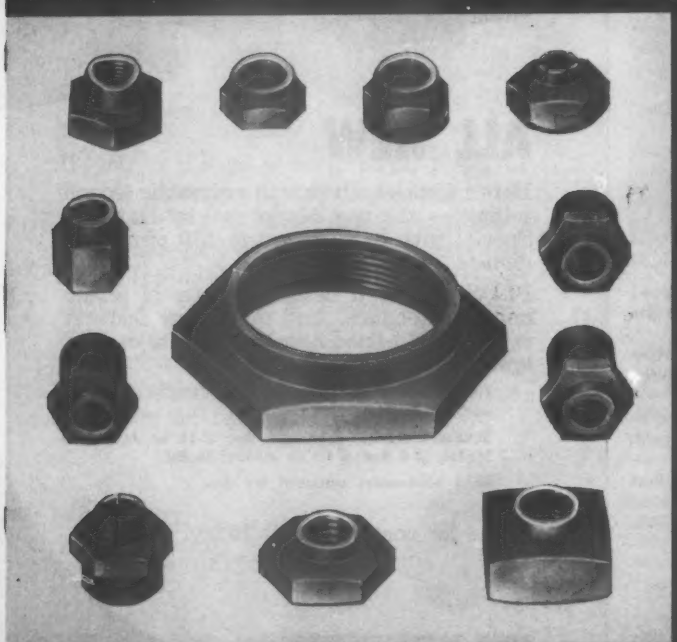
Three district representatives have been appointed by the Pop Rivet Division of United Shoe Machinery Corp. They will serve within their respective territories as sales engineers.

Carlyle Abbott, formerly a manufacturer's agent in Michigan, will cover part of Ohio as well as part of Michigan.

Thomas R. Freeman, formerly with the Remington Arms Co., will cover all of Colorado, Kansas, Missouri, Montana, Nebraska, N. Dakota, S. Dakota and parts of Kentucky, Tennessee and Illinois.

Ned B. Turner was associated for almost six years with a Texas construction company before joining the organization. He will cover Arizona, New Mexico, Oklahoma, Texas and part of Louisiana.

SPECIAL LOCKNUTS . . . *that solved fastening problems*



As the largest specialized nut manufacturer in the world we are constantly developing new methods and products for this phase of assembly in industry . . . in the field of locknuts we have made spectacular progress. Besides standardized hexagon "Conelok," "Huglock" and "Marsden," sizes #10—3" of ferrous and non-ferrous materials, we provide many special application nuts, upon a basis of these designs . . . a few of which are here shown . . . Our sales and engineering departments are available to help you solve your fastening problems . . . Send for 12-page condensus catalog, it includes complete specifications of our entire product, as well as engineering data. We also have an one hundred and forty four page catalog where more comprehensive information is required.

Manufacturers of Standard and Special ferrous and non-ferrous Hexagon, Square and "12 Pointer" nuts . . . "Conelok," "Huglock" and "Marsden" locknuts.

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IMPORTANT NEWS FOR SILVER BRAZING PREFORM USERS

NEW "CLOSE CLUSTER" DIE PROCESS CUTS BRAZING PREFORM WASTE, SAVES YOU MONEY!

Scrap means waste. And that adds to the cost of your silver brazing preforms. Precision dies arranged in a "close cluster" make maximum use of every inch of silver brazing or precious metal strip. This cuts waste, saves you money. Developed originally by Alloys Unlimited for the semiconductor industry, this new technique of "close cluster" stamping makes other methods old fashioned. Start saving . . . Send us your specifications, then compare our bids with your present costs. No obligation, of course.

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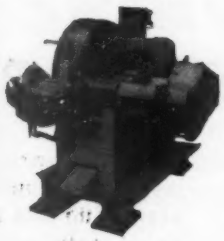

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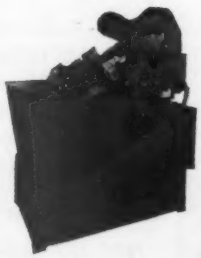
SLOTTERS
THREADERS
PINCH POINTERS
SHANK SLOTTERS
WIRE STRAIGHTENERS
Engineers and Manufacturers of Dies and Punches



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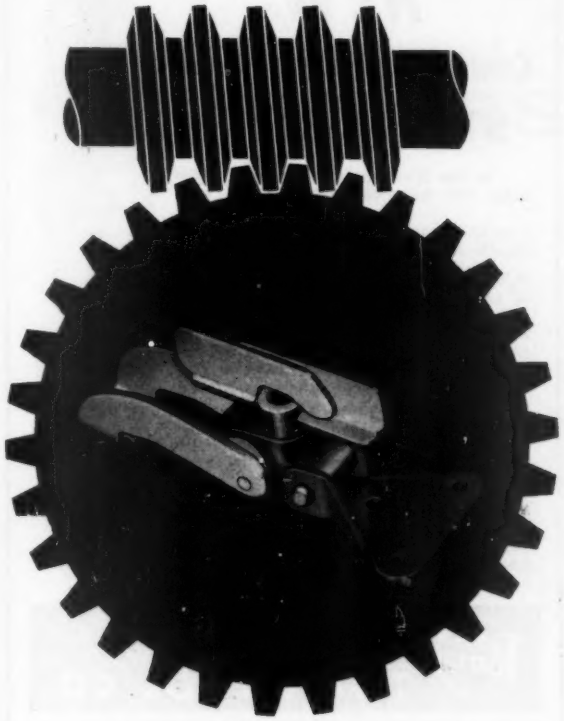
Exclusive from Bassick:



The clamp with "worm-gear advantage"

The tremendous mechanical advantage of the time-tested worm-gear mechanism is at your disposal in Bassick's "Gear Lock" clamp series . . . the only clamp of its kind manufactured.

Each Gear-Lock clamp can sustain a force of up to 2000 pounds—twenty *times greater than the best resilient clamp.* Gear-Locks are designed especially for air-tight, pressure-tight, or de-humidified containers of steel, aluminum, plastic or other materials. They're secure against shock and vibration, and can be fixed in a literally infinite number of closing positions, eliminating the necessity for "custom mounting" each clamp.

Gear-Lock clamps are just one of the extensive assortment of clamps, fasteners, strikes, springs, and levers manufactured by Bassick for both military and general industrial use. You'll find the complete line, plus a variety of typical applications, described and illustrated in Bassick Catalog No. CF-60.

Write for your copy today. THE BASSICK COMPANY, Bridgeport 5, Conn. In Canada: Belleville, Ont. 1.12

See our catalog in Sweet's Product Design File

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Bassick
A DIVISION OF
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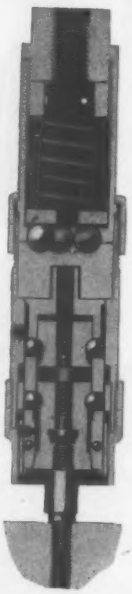
NEW

Controlled (Torque) Drive

STUD DRIVER

. . . for Stud Driving applications requiring limited torque while driving the stud



A necessity where a limited amount of torque is desired—as in driving shoulder studs.

As shown in the sectional view, this new tool has an adjustable over-running clutch so that the stud can be driven to any predetermined torque. Simple adjustment is made by removing the two Allen screws in the spring adjusting nut (directly above spring) and moving it downward for increased torque, or upward for decreased torque. It is not necessary to stop rotation at any time while driving studs. Other outstanding Titan Stud Driver features are an automatic take-up for jaw wear, and an inexpensive method of changing the cam ring.

While not designed for use with impact wrenches it is an ideal tool for use with any air or electric drill or drill press at constant speed. Available in sizes No. 101, No. 102 and No. 103.

Write for details and prices

TITAN TOOLS

World's Largest Producers Of Stud Drivers And Pullers

TITAN TOOL CO.

47 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

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EUTECTIC ELECTS BOARD CHAIRMAN, PRES.

BARR

WASSERMAN

Leonard C. Barr has been elected president of Eutectic Welding Alloys Corp. and Rene O. Wasserman, who founded the company 21 years ago has been elected chairman of the board of directors.

Barr comes from Gregory Industries, Lorain, Ohio, where he was executive vice president. He was founder of Gregory and remains a director and one of its largest stockholders.

Wasserman has been president and director of research of Eutectic since its establishment in 1940. He is inventor or co-inventor of more than 60 of the company's basic patents.

CANNON ELEC. GRANTS MFG. LICENSE

Liberty Electronics Corp., Inglewood, Calif. and Cannon Electric Co. of Los Angeles announced arrangements licensing Liberty to engage in a manufacturing process for Cannon connectors.

The program would encompass both military standards and commercial connectors.

HARPER ACQUIRES ANTI-CORROSIVE

The H. M. Harper Co. has acquired Anti-Corrosive Metal Products Co., for an undisclosed amount of cash.

The newly acquired firm specializes in the manufacture and distribution of stainless steel industrial fasteners, as does the Harper Co.

Also announced were two changes in management at Anti-Corrosive. Earle A. Channer, vice president-sales at Harper was elected president to replace Bernard T. Brennan;

THE P37 P NUT — THE LATEST IN PRESS NUTS

NO WORK DEFORMATION
Serrations contain all displaced material to eliminate work buckling while shoulder prevents off perpendicular nut positioning.

LIQUID TIGHT LOCK
During press-in, displaced metal flows into retaining groove of the P-NUT to assure a positive lock between the serrations and the drilled hole.

HOLE PREPARATION
A single punched or standard drill size hole matches the P-Nut's pilot diameter.

THREAD SIZES
All popular coarse and fine thread sizes from 4-40NC to 1/2-20UNF are available.

VISUAL INSPECTION
When you see the shoulder bottoms on the work, you know the P-Nut is properly installed.

The P-Nut provides a simple, very inexpensive, method for attaining load bearing threads in thick or thin ductile sheet metal such as aluminum, mild steel and copper alloys.

P-Nuts are pressed into the work with standard hydraulic or pneumatic presses, bench vices or even driven in with a few blows of a hammer. No special installation tools are needed.

The P-Nut's excellent push-out and torque-out values assures a positive lock ...especially desirable for the many vibration and repeated use applications found in the commercial, electronic and aero-space industries.

Write today for illustrated brochure.

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APCO TORQUE TOOLS TO MEET EVERY REQUIREMENT

Apco Mossberg manufactures over 75 standard styles of torque tools ranging from an inch gram to 2000 foot pounds. In addition, they build many special tools for specific applications.

Every Apco torque tool is manufactured to rigid specifications to assure you the best available. They meet government standards, and are built to withstand 50,000 flexes without adjustment.

The Apco Mossberg Catalog of Torque Tools describes all styles, giving full information as to capacity, sizes and price. Write for your copy now.

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Why is SPIROL the true spring PIN a more versatile fastener?

SPIROL PINS are used in a wider variety of materials: To provide spring pins that will not damage, distort or rupture holes even in soft, brittle or thin materials, SPIROL PINS come in MEDIUM and LIGHT DUTY, as well as Heavy Duty for more rugged uses. The entire length of a SPIROL PIN assumes the shape of its hole radially, giving greater shear, shock and vibration resistance. Therefore, MEDIUM and LIGHT DUTY PINS apply where other flexible pins cannot be used.

Where corrosion resistance is needed, SPIROL PINS are the only spring pins stocked in NICKEL STAINLESS STEEL (302). Two sizes are used in the water faucet shown above.

Automatic Assembly: SPIROL PINS cannot interlock and jam hoppers. Uniform chamfer on both ends speeds inserting pins into holes.

Most complete range of standard diameters: MINIATURE SPIROL PINS (1/32", .039", 3/64", .052") thru 3/4".

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SPIROL

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HONEYCOMB and sandwich panel FASTENERS

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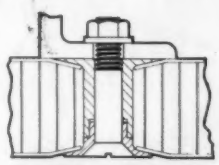
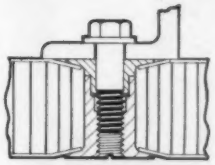
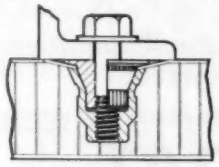
by Delron



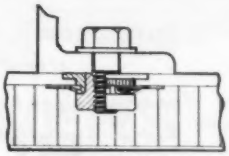
GROMMET FASTENER
Series 101 and 102
Thru-Rivet and Thru-Bolt Type



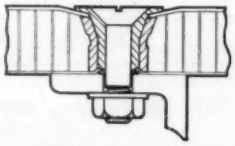
GROMMET FASTENER
Series 103
Series 104 (Self-Locking)



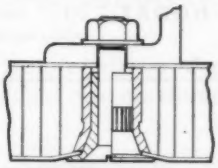
BLIND FASTENER
Series 293
Internal Thread Blind Type



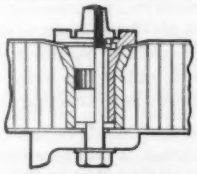
BLIND FASTENER
Series 293K
Threaded Clinch Type



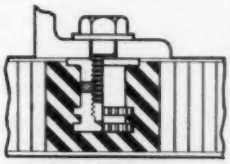
STRUCTURAL FASTENER
Series 600 Flared
Thru-Rivet and Thru-Bolt Type



STRUCTURAL FASTENER
Series 600 Regular
Thru-Rivet and Thru-Bolt Type

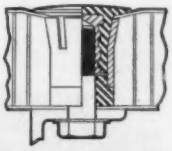


STRUCTURAL FASTENER
Series 700
Floating Locknut Type



MOLDED-IN INSERT
Series 404H
Blind Molded-in Type

• *Illustrated are only a few of the many available types of Delron Sandwich Panel Fasteners. Write for complete Technical Data.*

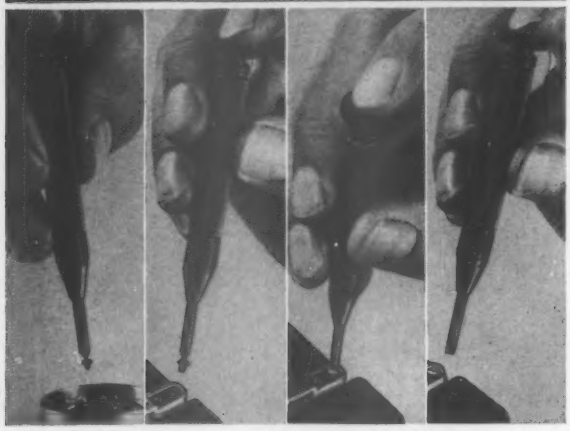


STRUCTURAL PLASTIC FASTENER
Series 680
Internal Thread Type

THE DELRON COMPANY, INC.
5224 Southern Ave., South Gate, Calif. • LOrain 7-2477
Largest Manufacturer of Specialized Sandwich Panel Fasteners

Use postpaid card. Circle No. 275

FASTER Handling of TINY Screws



PICKS UP/INSERTS/TIGHTENS/RELEASES
AUTOMATICALLY

Fast, smooth, one hand operation

NON-MAGNETIC

For screw sizes No. 4 to No. 0 and smaller

HODAT T. M.

AUTOMATIC SCREW-HOLDING DRIVER

Write for literature to:

HODAT, 3017 Summit St. • Oakland, California

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and H. M. Harper, Jr., secretary at H. M. Harper was elected vice president and assistant secretary.

Frank J. Legnard and John W. Mannin will remain as vice president-treasurer and secretary, respectively.

SPIRON FASTENER ELECTS V.P.

Gordon Moos has been elected vice president in charge of the fastener division of Spiron, Inc., Silver Springs, Md. The firm manufactures aircraft and missile fasteners, electronic components and other products for military and industrial use.

He will be in charge of all fastener sales and merchandising, new product development and government and industry standardization programs.

Moos formerly was assistant to the vice president in charge of sales and production for Waldes Kohinoor, Inc. He joined Spiron in 1950 and a year later was appointed government sales representative. He was named assistant to the vice president in 1953.

OMARK, KSM CROSS-LICENSE STUD WELDING

A cross-licensing agreement on stud welding equipment and studs widely used in the appliance manufacturing and metal working industries has been completed by Omark Industries, Inc. of Portland, Oregon and KSM Products, Inc., of Moorestown, N.J. The agreement was an amicable settlement of patent litigation pertaining to the welding techniques known as the "initial contact" and the "initial gap" method.

With the settlement, both Omark and KSM will continue to manufacture and sell stud welding equipment and studs under a licensing agreement covering various patents which each own respectively. KSM also manufactures other types of stud welding equipment not covered by Omark patents.

*Something **NEW** you should know about!*

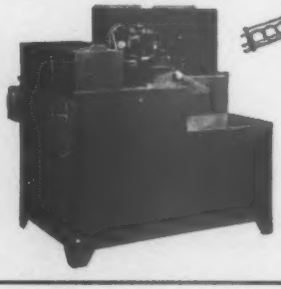
FEEDMATIC-DETROIT AUTOMATED EQUIPMENT

Now, you can speed small parts production and cut costs with new Feedmatic electrically controlled machines. These units automatically and continuously feed, inspect, segregate or assemble parts at greater efficiency . . . reduce handling costs on high volume operations. Use Feedmatic automated machines separately or for high speed delivery to machine tools, heat treating furnaces or final assembly areas.

If your operation involves the manufacture or processing of parts in volume quantities, it will pay you to investigate the cost saving advantages of Feedmatic automated equipment. *Send us your problem today!*

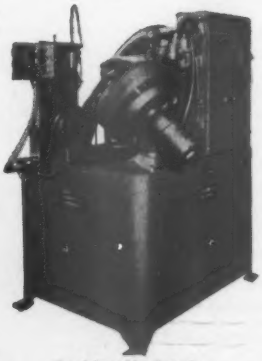
FEEDMATIC-DETROIT, INC.
P.O. BOX 115-B • SOUTHFIELD, MICHIGAN

Automatic Gaging Machine measures and sorts parts. Adjustable stops, anvils and gage heads to facilitate change over to different size parts. Tolerance of electrical gages adjustable from .0005 to .020.



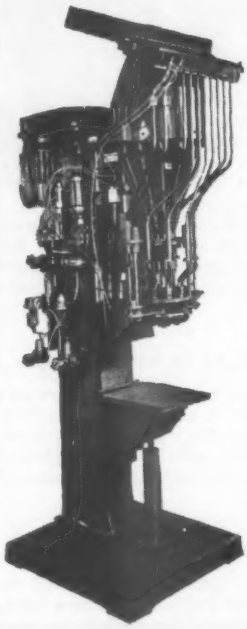
Model 12F Floor Hopper. Parts storage capacity, 12 cubic feet. For automatic feeding of larger parts.

Rotary hopper unit. Fast, efficient parts feeding. Available in sizes from 8" to 24". Feed tracks engineered to meet specific job conditions.



Special machine for automatically assembling automotive components.

this machine will drive up to 10 screws at one time . . .



. . . reducing assembly costs and improving quality. Built for high production jobs where a fixed set up is practical, this multiple spindle screw driving machine automatically feeds screws from a hopper and drives them to a predetermined torque. Evenly distributed pressure eliminates stresses caused by driving home one screw at a time. A simple sliding fixture positions work pieces accurately.

Machine illustrated shows application of multiple spindle screwdriving to assembly of electric power drills.

Send a sample of your assembly and a list of your requirements. We will be happy to show you how multiple spindle screw driving can be applied to your job.

COOK & CHICK COMPANY
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Important SAVINGS to VOLUME users of small parts

thanks to **MULTI-SWAGE**

Many large volume users of solid pins for electronic and mechanical purposes have cut costs by switching to Multi-Swaged *tubular* pins . . . without sacrificing strength or accuracy. Multi-Swage parts serve as terminals, contacts, bearing pins, stop pins, male-female connections, etc., in a wide variety of products such as Business Machines, Ventilator Louvres, Toys, Radio and Television Apparatus, Terminalboards, Electric Shavers, Phonograph Pickups, etc. Send part (up to ¼" dia. and to 1½" length) and your specs for a quotation. Or write for DATA BULLETIN.

B® The BEAD CHAIN® Mfg. Co.
208 Mountain Grove St., Bridgeport 5, Conn.

Manufacturers of BEAD CHAIN — the kinkless chain of a thousand uses, for pull and retaining chains and other industrial uses; plumbing, electrical, jewelry, fishing tackle and novelty products.

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GRIPCO TOPLOCK NUT
One piece all metal.

GRIPCO CLINCH NUT
With or without self-locking threads. Hex collar prevents turning when torqueing bolt.

You get these "extras" when you specify GRIPCO®

GRIPCO PILOT PROJECTION WELD NUT
With or without self-locking threads. Centering collar positions nut and protects threads from weld spatter.

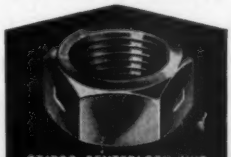
FASTENERS—

Service — 40 sales representatives all over the country for prompt, fast service.

Reliability — Quality controlled by the oldest established lock nut manufacturer in the U.S.

Stock — Large inventories to ensure out of stock delivery on all catalogued items.

Speed production and lower costs on your products with this GRIP NUT family of GRIPCO FASTENERS. Qualified fastener engineers are available for consultation on all your assembly problems. Consult the yellow pages in your phone book under "GRIPCO" for the one nearest you.



GRIPCO CENTERLOCK NUT
Locking feature in the center for fast feeding. Can be applied from either end.

GRIPCO COUNTERSUNK WELD NUT
With or without self-locking threads. Countersink protects threads from weld spatter.

Other Gripco Products:

- Brass Toplock or Centerlock nuts.
- Miniature weld and clinch nuts, with or without lock.
- Toplock and Centerlock Hi Nuts.
- Standard Semi-finish full and jam nuts.
- Stainless Steel lock, weld and semi-finish nuts.
- Cold formed special nuts or parts to print.

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Phone: South Whitley 723-5111

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HUCK NAMES FASTENER DEVELOPMENT MGR.

Charles F. Marschner has been named manager, fastener development.

In his new position, he will direct research laboratory activities as well as development and project engineering operations.

An aeronautical engineering graduate, Marschner brings to his new job a background of 25 years in project engineering, research engineering and management positions in the aircraft and plastics industries. His experience includes associations with Chance Vought Aircraft, The Martin Co., McDonnell Aircraft and Lockheed Aircraft Corp. His most recent position in the aircraft industry was as manager of Polaris production engineering for the Lockheed Missile Systems Division in California.

SCREW AND BOLT CORP. ELECTS DIRECTORS

Louis Berkman, chairman of the board of the Screw and Bolt Corp. of America has also been elected president. Allen H. Berkman, attorney, Alvin G. Keller, vice president, Mellon National Bank & Trust Co., both of Pittsburgh and Charles B. Lanman, Ohio Nut & Washer Co., were elected directors.

COMPUTER TECHNIQUE FORECASTS SALES

An electronic sales-forecasting technique developed by Radio Corporation of America for its own use, is now being offered as a "package" to American business without cost.

The technique is a direct outgrowth of computer programming methods in the RCA 501 electronic data processing system. Firms which own or lease data processing equipment may obtain an available "do-it-yourself" manual of

With Eastman 910 Adhesive...

Strong nylon-to-nylon bonds in 10 seconds

Skeptical? We don't blame you. But the fact is that the A. W. Haydon Co. of Waterbury, Conn., is doing just that. Using a simple jig and a few drops of Eastman 910 Adhesive, Haydon bonds a molded nylon timing gear to a nylon cam. No heat, solvent or excessive pressure is used. Ten seconds later, the unit is ready to be assembled into an automatic telephone switchboard timer.

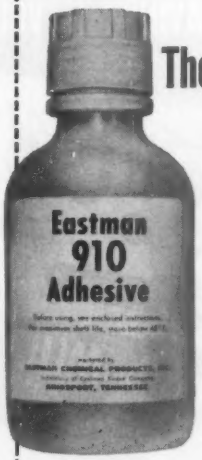
Eastman 910 Adhesive will form bonds with almost any kind of plastic material (and most other materials).

Still skeptical? Then send $5 for a trial kit and try it on *your* toughest job. Kits and further information are available from Armstrong Cork Company, Industrial Adhesives Division, Lancaster, Pa., or Eastman Chemical Products, Inc., Kingsport, Tennessee.

Here are the types of plastic-to-plastic bonds that can be made with Eastman 910 Adhesive

Among the stronger: *vinyls, polystyrene, phenolics, cellulosics, polyesters, polyurethanes* and *nylon.*

Among the weaker: *polyethylene* and *fluoro-hydrocarbon* plastics (shear strengths up to 95 lbs./in.²).



There is no adhesive like Eastman 910 Adhesive

Sets fast—Makes firm bonds in seconds to minutes.

Versatile—Joins virtually any combination of materials.

High strength—Up to 5,000 lbs./in.² depending on the materials being bonded.

Ready to use—No catalyst or mixing necessary.

Cures at room temperature—No heat required to initiate or accelerate setting.

Contact pressure sufficient.

Low shrinkage—Virtually no shrinkage on setting as neither solvent nor heat is used.

Goes far—One-pound package contains about 14,000 one-drop applications.

The use of Eastman 910 Adhesive is not suggested at temperatures above 175°F., or in the presence of extreme moisture for prolonged periods.

See Sweet's 1961 Product Design File 10d/Ea.

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JACK NUT

The Only Blind Fastener Which Grips Any Material From 0" To 3/8" Thick

The Jack Nut cuts cost, speeds assembly, solves hitherto impossible fastening problems. Can be used as a rivet and/or blind fastener. It's versatile, easy to use and no special tools are needed.

The only blind fastener with threads which grips any material from 0" to 3/8" thick. Needs only 1/8" expansion space. Allows holes to be fashioned before, during or after fabrication. Hole size is not critical and special type of hole is not necessary.

Made of quality steel, cadmium-plated. Grips evenly on rough as well as smooth surfaces. Provides vibration-proof assembly. Weight-carrying capacity is limited in most cases only by strength of the material in which used.

EASY TO INSTALL

1 Insert Jack Nut into hole. Needs only 1/8" expansion space.

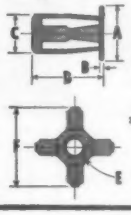
2 Run in screw to collapse spider anchor backing by exerting pull on thread.

3 Jack Nut now is installed and ready to receive attachment screw.

Sold By Wholesale Hardware, Electrical Wholesale & Industrial Supply Distributors

MOLLY® CORP.
2306 N. 5th St., Reading, Pa.

SPECIFICATIONS



	CAT. NO.	A CAP DIA.	B CAP THICK.	C BODY DIA.	D O'ALL L'GTH.	E THREAD	F MAX. SPREAD
	4-S, JN	15/32	3/64	9/32	9/16	6-32	43/64
	4-L, JN	15/32	3/64	9/32	3/4	6-32	43/64
*	6-S, JN	17/32	1/16	3/8	11/16	10-24	25/32
**	8-S, JN	5/8	1/16	27/64	3/4	1/4"-20	13/16

S for 0" to 3/16"; L for 3/16" to 3/8"
*8-32 & 10-32 threads available
**10-24 & 12-24 threads available
NOTE: 4-S, JN & 6-S, JN also available in brass

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Nothing SEALS as POSITIVE!

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ROLLED NYLON WASHERS

make a positive seal up to 250°F and can be used with any standard fastener including tapping screws

NYLTITE WASHERS SEAL AND STOP LEAKS
WITHSTAND PRESSURE UP TO 15,000 PSI
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VITAL FASTENERS—rivets, nails, screws, pins; threaded, shouldered, drilled, close tolerance, AN specs, special alloys.

The fastener itself is often a minor part of your assembly cost. If a Hassall Job-Designed rivet can reduce assembly time, meet re-design demands quickly and make joining simpler, lower costs will result.

VITAL METAL PARTS—shafts, axles, studs, spacers, stops, hinges, clutch rollers and thousands of vital component items. All available from the limitless possibilities of cold forming, the technique that moves, rather than removes, valuable metal; no chips, no waste.

Our catalog illustrates the variety of shapes and sizes available to you when the need arises for vital fasteners and parts.

We offer design and material selection assistance. Send sketch and/or samples.

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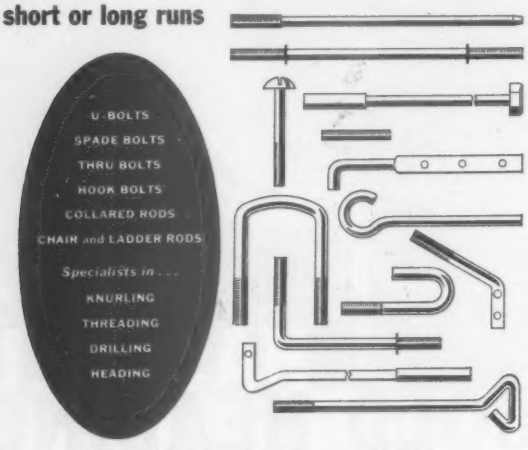
Complete Facilities for the manufacture of Special Headed and Threaded fasteners / from 1" to 60" in length in short or long runs



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18-8 and 316

STAR STAINLESS **SOCKET HEAD CAP SCREWS**

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instructions, plus consulting support and assistance in applying the program.

Firms not having these facilities, can, for a fee, apply the technique at an electronic systems center, such as the ones operated by RCA in New York, Washington, D.C., Chicago and Cherry Hill, N.J.

DEVELOPMENT MGR. AT ALPHA-MOLYKOTE

John R. Jones has been appointed manager of new product development at Alpha-Molykote Corp. In this position, he will be responsible for the development of new lubricants to meet increasingly demanding requirements of modern technology.

Jones joins the company from the Boeing Airplane Co., where he has been materials engineer in charge of fuels, lubricants and hydraulic fluids. He holds many patents in the lubricant and lub. oil additive fields.

TWO APPOINTED AT ALLOYS UNLIMITED

NELSON

BERNSTEIN

A. Stanley Nelson, Jr. has been appointed general manager of the Electronic Glass and Ceramic Corp., Cambridge, a newly created division of Alloys Unlimited, Inc.

In his new position, he will be responsible for the operation of the entire division.

Before joining the new company, Nelson managed the

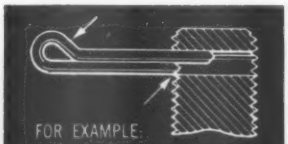
EVERY KIND, SHAPE, SIZE COTTER PIN

for any specific purpose or general mechanical use is manufactured by

WESTERN WIRE PRODUCTS COMPANY
1457 S. 18th • St. Louis 4, Mo.

Western Wire makes the largest and most complete line of cotter pins in the U.S. WW Cotter Pins are consistently accurate even in complicated shapes — designed and produced in strict accordance to specifications.

Write for prices and samples too, if wanted.



FOR EXAMPLE:
Castle Cotter COTTER PINS

Expressly made for castellated, grooved and special nuts.

NO HAMMER DAMAGE TO VALUABLE FITTINGS

Fig. 1—Offset head countersinks with no forcing.

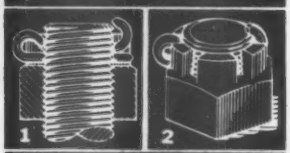


Fig. 2—Long prong is designed to clinch back to maximum "safe" position; holds nut securely.

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This free manual shows all sizes and styles of loop clamps, bonding clamps, multiple clamps, center clamps, wire harness clamps, wave-guide clamps—plus blocks, brackets, busbars, line supports, and related items.

Sizes from ⅛" to 6" diameter in 16ths for bolt mountings from #4 to ⅜". Available in aluminum, steel, and stainless. All manner of high and low temperature insulation materials.

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- Types of Blanked and Edgewound Washers.
- Alloy calculation charts.
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- Silver and Aluminum Brazing Alloys — Soft Solders.
- Types of Flux and application.

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YOU GET INDIVIDUALIZED SERVICE FROM THOMPSON-BREMER

We are one of the few fully integrated manufacturers of Sems, lock washers, thread-cutting screws, terminals and cold-headed specialties. Since our engineering services and components manufacturing are together under one roof, we are particularly well able to give you fast, individualized service at competitive prices. We'll bid on your specials requirements, or fill orders for standard items on short notice from the extensive line of EVERLOCK products stocked by your local distributor. Send for catalog and samples or call your EVERLOCK representative.

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Division of
American Machine
& Foundry Company

Thompson-Bremer & Co.
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Please send me_____EVERLOCK fastener catalogs and_____sample sets of EVERLOCK industrial fasteners and cold-headed specialties.

Name_____ Title_____
Company_____
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GENUINE
CUSHION GRIP
SCREWDRIVERS

50% GREATER TURNING POWER

- Super Comfortable
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Resilient Nitrile Rubber CUSHION GRIP lets you turn screws tighter with less work — reduces fatigue — increases productivity

Blisterproof — oil & water resistant Nitrile Rubber Grip permanently locked into tough amber handle.

New! Patented* INTERLOCK Handle. Cannot slip, slide, twist or come off.

Bolstered Blade winged shank for maximum strength

Tested and acclaimed by electricians, automotive & industrial mechanics under actual working conditions.

Blade of high grade chrome plated hardened alloy tool steel

Precision cross-ground point

Available from Jobbers or write to manufacturer

19 sizes and styles. Regular points and Super Hard Phillips. $1.00 to $2.80 list. *Pat. No. 2871899

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BRIDGEPORT 1, CONNECTICUT
Subsidiary of PUROLATOR PRODUCTS INC

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Simplify design, purchasing, production with

MOORE PDQ* SET SCREWS

*PDQ means price, delivery, quality. And you get all three with Moore Set Screws. The PRICE is right. Ample production capacity and inventories assure fast DELIVERY. And rigid control standards guarantee there's no skimping on QUALITY. Specify Moore Set Screws and *be sure*. Dependable quality for over 80 years.

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MOORE SET SCREWS

George W. Moore, Inc.
since 1880
91 Beaver St., Waltham 54, Mass.

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purchasing department of the semiconductor division of CBS Electronics.

Leonard Bernstein has been named director of research and development. He will supervise the development of new alloys for use in semiconductor devices.

Before joining the company, he was in charge of the metallurgy section of the advanced device department of Hughes Semiconductor, where he specialized in alloy development, and alloy fabrication techniques.

PARKER-KALON NAMES 3 REPRESENTATIVES

KNOBLOCH

KEEBLE

HANSEN

Richard Knobloch has been appointed field sales representative of the Parker-Kalon Co., Clifton, N.J. He will represent the company in southern Indiana, Kentucky, parts of Ohio and Illinois.

John Keeble will represent the company in southeastern Pennsylvania, southern New Jersey, Maryland, Delaware, northern Virginia and the District of Columbia.

Henry Hansen will cover the Rocky Mountain states of Colorado, Wyoming, Utah and New Mexico for the company.

Before joining Parker-Kalon, both Keeble and Hansen were associated with Pheoll Manufacturing Co.

NYLOK NAMES JOHNSON V.P. ENGINEERING

J. Algot Johnson has been appointed vice president in charge of research and engineering of the Nylok Corp. The position formerly was held by J. E. (Ned) Johnson, who is now president of Aerospace Nylok Corp.

Algot Johnson previously served as scientific director of the U.S. Army Transportation research and engineering command. Prior to this association, he was general mechanical engineer of ACF Industries' engineering department, where he was in charge of design and development of railroad and other transportation equipment.

DEL MFG. NAMES WESTERN AGENT

Haskel Engineering and Supply Co., of Glendale and San Francisco, will be the exclusive agent in the 11 western states for Del Manufacturing Co.'s self-conforming shaft seal and its Pneuflex seal.

LEITZKE a reliable LOW COST SOURCE for

- CLEVIS PINS .....
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Prepared by the Committee on Brazing and Soldering, American Welding Society. Here in one handy volume are the full, up-to-the-minute details of all brazing processes, now used in the automotive, aircraft, refrigeration, electronics and other mass-production metal industries! Written by the country's top experts on all aspects of brazing, and replete with charts, tables and illustrations, the manual brings practical information to answer every type of brazing problem. 208 pages, price $4.75.

FILLER METALS FOR JOINING

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ONE LAST WORD

IS THE U.S. LOSING THE RACE?

Anyone interested in America's economic future looks with horror on the implications of the January shipments of the American machine tool builders. These implications are shocking. How does anyone, having his country's welfare at heart, sleep soundly at night? And it makes no difference whether one manufactures machine tools, autos, bolts, grinding wheels, appliances, or toys.

Shipments of all types of metal cutting machine tools totaled $35.5 million. Of these $14.5 million were foreign shipments, or a whopping 41%. The balance, or $21 million, were domestic shipments. The implications which worry us lie in the ratio of foreign to domestic orders.

To be sure, the builders are thankful for the foreign business; without them their plight would be catastrophic.

Why are foreign industries, especially European automotive, plunking down hard cash for American machine tools? Primarily, because the European machine tool industry, producing to capacity, cannot meet the demand. (By contrast, our own machine tool industry is below 50% of capacity.) The significant point is this: foreign industries are expanding and modernizing so rapidly that their own machine tool industry cannot meet the programs of their industries. And when we reflect that West Germany alone has over 500 machine tool builders, (the U.S. has 376), and add to this the builders of Great Britain, France, Italy, Belgium, Switzerland, Japan and the Soviet bloc, we are staggered by the foreign machine tool industry, producing to capacity, raising the industrial facilities of the western world to monumental heights. Compare this to the snails-pace program of the U.S., building little brown mole hills!

With the exception of the U.S., all industrial nations are arming for an assault on world markets, including our own domestic market.

With the exception of the U.S., all industrial nations are modernizing their facilities, replacing their equipment so that the world's needs for products of every kind and description will be satisfied. Not satisfied with American goods! No, the goods of other, better equipped, nations!

The U.S. is not modernizing at the rate it should; it is not replacing obsolete clunkers; it is not reinvesting in productive equipment and facilities. The climate, tax-wise, for modernization and capital expenditures has not only been poor, it's been criminal.* Thus we see foreign customers buying our machine tools, in addition to their own, to increase productivity; at the same time we run around, spread gloom, complain, and let the old clunkers rattle around for another five years.

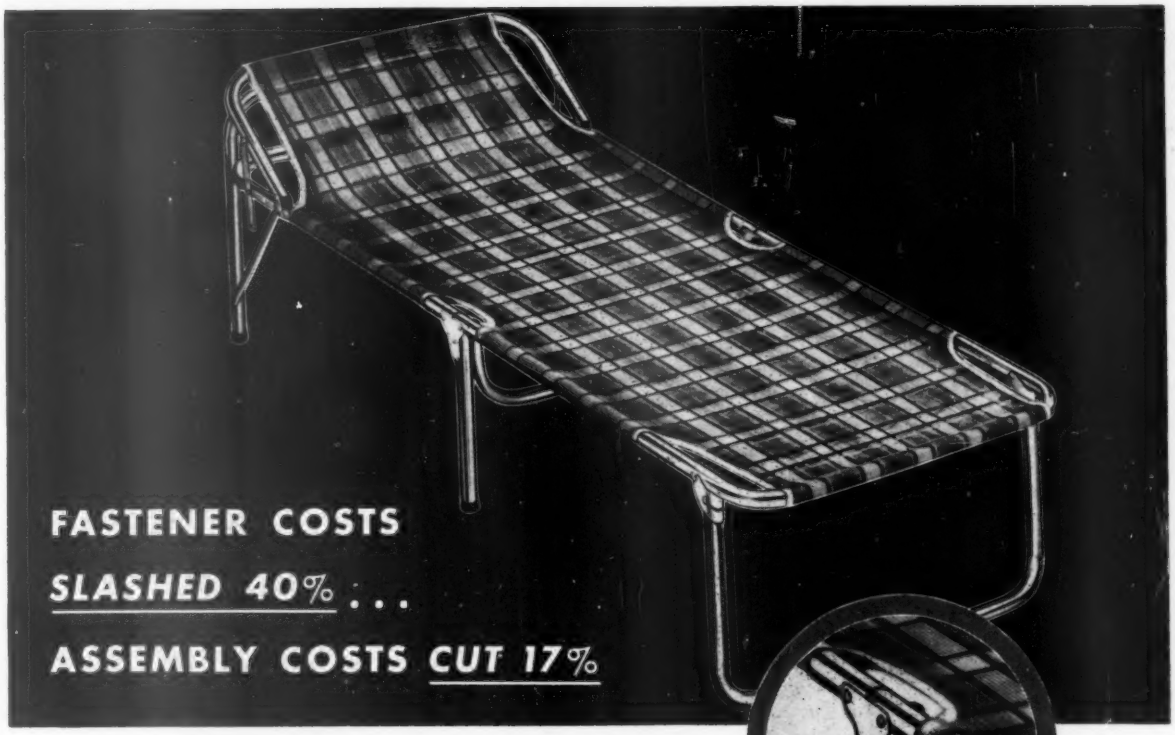
The goods and products which foreign nations will produce economically with our tools will haunt us. The import picture (and we have no fight with importers, believing, as we do, in free trade) will be black for American business and for the American worker. We will never compete in world markets, or our own domestic markets, with foreign producers who operate efficiently in modern plants; and who pay lower wages.

The U.S. must replace, must modernize, must grow up industrially and take advantage of new techniques, it must forge its weapons in a healthy fiscal and a sound depreciation climate. This is as urgent as finding a bucket for bailing out a water-filled boat.

*We are encouraged by President Kennedy's awareness of this problem and by his desire to do something about it. A report of this is on page 13 of this issue.

Wm. F. Schleicher

Vice President & Editorial Director



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